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PRIZE ESSAY.

A FEW HINTS TO THE STUDY OF NAVAL TACTICS.

By LIEUT. W. S. PYE, U. S. Navy.

Motto: Let each one bring a candle that we may have more light.

In submitting this article the writer desires to state that little claim is laid to originality of ideas in the method of treating the various subjects. He merely hopes that the different point of view may give more matter for argument.

Commander Niblack has discussed many of these same formations with regard to advance and lateral transfer and the advantage of position upon completion of the movement. The writer has gone a step further by a comparison of the time necessary for the performance, and the consideration of the interference with gun fire, due to swinging of the ships, during the evolution.

In the diagrams ships are placed 400 yards apart, and are considered as having a standard speed of 15 knots and a reserve speed of 18 knots. The turning curves are for a tactical diameter of 600 yards and a final diameter of 540 yards.

The study of modern naval tactics has led officers of the United States and Royal Navies to the general conclusion that single line

tactics will be more effectual in a modern battle than either the double line or group formations.

Only "single line tactics" will be discussed in this article, though Plate I shows the mean ranges for each squadron when two formations, commonly used in European navies, are compared to column formation, fire being distributed as shown. Dashes, fire from ships of the group formation; dots, fire from ships of the column formation.

It is evident from this comparison that shortening the formation increases its depth. In the group formation the ships nearest the enemy are at a shorter mean range than the mean range of any ship in the column formation to the ships of the group formation.

Flexibility is claimed for each of these formations, but a change of the direction of the group, in either of the group formations, demands a change of speed in several ships. This does not apply to a change of course, but to a change in the lines of bearing of the parts of the group. Each change of speed is detrimental to gun fire efficiency and single line tactics offer the best solution for change of direction and formation without change of speed.

The above remark can only be applied to the speed when regarded as a change due to difference in the throttle opening, for it is well known that a ship slows when making a turn, and also that the number of revolutions of the engines will vary during the turn, the inner engine slowing and the outer engine speeding up, even though the throttle opening remains the same during the turn.

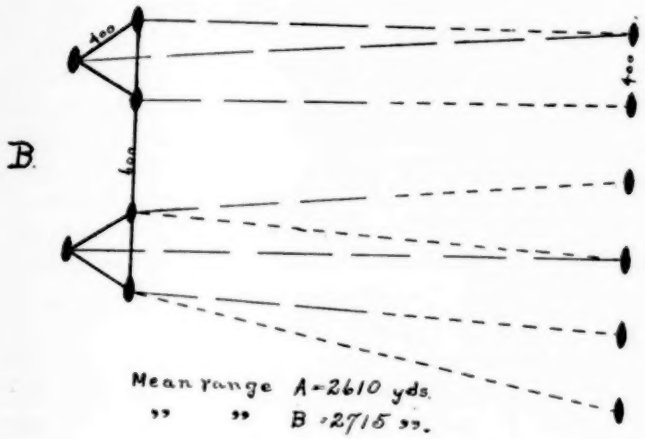
SINGLE LINE TACTICS.

Single line tactics comprise evolutions in three formations, namely: "Exact column," "Line," and "Line of bearing."

Exact Column.—When ships of a squadron are at a given distance apart, on the same course, and the line of bearing is the same as the course, they are in exact column.

This formation is known as exact column, but, for brevity, the word column will be used to denote it hereafter in this article.

Column formation is the most flexible, that is, it permits of changes of course, speed, or formation, with the least chance of confusion; other formations may be quickly taken, and the course may be changed by the head of column without signal, each ship


400
400
B.
A.
Mean range A=2610 yds.
" " B=2715 ".

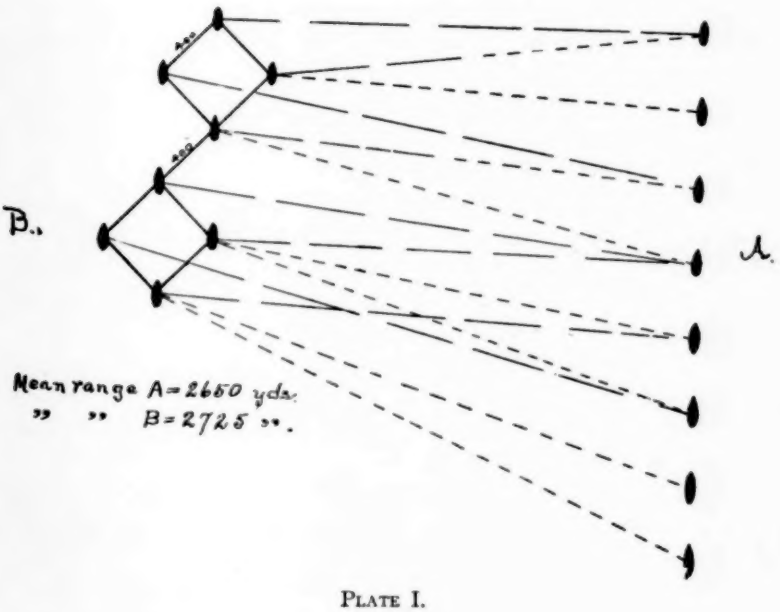

400
400
B.
A.
Mean range A=2650 yds.
" " B=2725 ".

Plate I.

following in the wake of the preceding ship without change of speed.

No disorder is caused by a ship dropping out of formation, for even if her engines are suddenly stopped, she can sheer to one side and be clear of the column by the time the next ship overtakes her. In case of a steering gear becoming disabled, with the helm jammed in either direction, the ship will gradually sheer out of the column without causing any other ship to leave the formation. The distance between ships will be increased by a ship leaving the formation, but this distance can be closed up, by the use of reserve speed, in several minutes.

Column is the best formation for maximum gun fire if the target can be kept on the proper bearing. The fulfillment of this condition is one of the primary aims of naval tactics. Column allows a broader variation of bearing of the target for maximum gun fire than any other formation. It will be seen from Plate II that with 45° arcs of train forward of, and abaft, the beam, the area at any point of which full broadside fire from all ships may be delivered is limited by a 90° angle at a point abreast the middle of the column, at a perpendicular distance of one-half the length of the column, the limiting lines of the angle being continuations of the lines connecting the ends of the column with the above-mentioned point. This angle is shown in the diagram as *DFE*.

Between the parallel lines *CG* and *DH* some ships will have broadside fire and some ships bow fire, the volume of fire diminishing as the line *CG* is approached.

Within the angle *BKC* all ships can bring their bow fire to bear. The angle *LGA* represents the half angle through which only one ship can fire, the ships in the column astern of the leader being blanketed. It is not necessary to show the lines of bearing on the other side or at the other end of the column, as they are similar to those in the diagram. The greatest efficiency of gun fire, considering the range, will be at the point *F*.

Column is the best formation during the action, but the poorest for approach or retreat.

Line.—When ships of a squadron are at a given distance apart, on the same course, and on a line of bearing at right angles to the course, they are in line.

Line is not as flexible as column. All changes of course or formation must be signaled. In the event of a steering gear

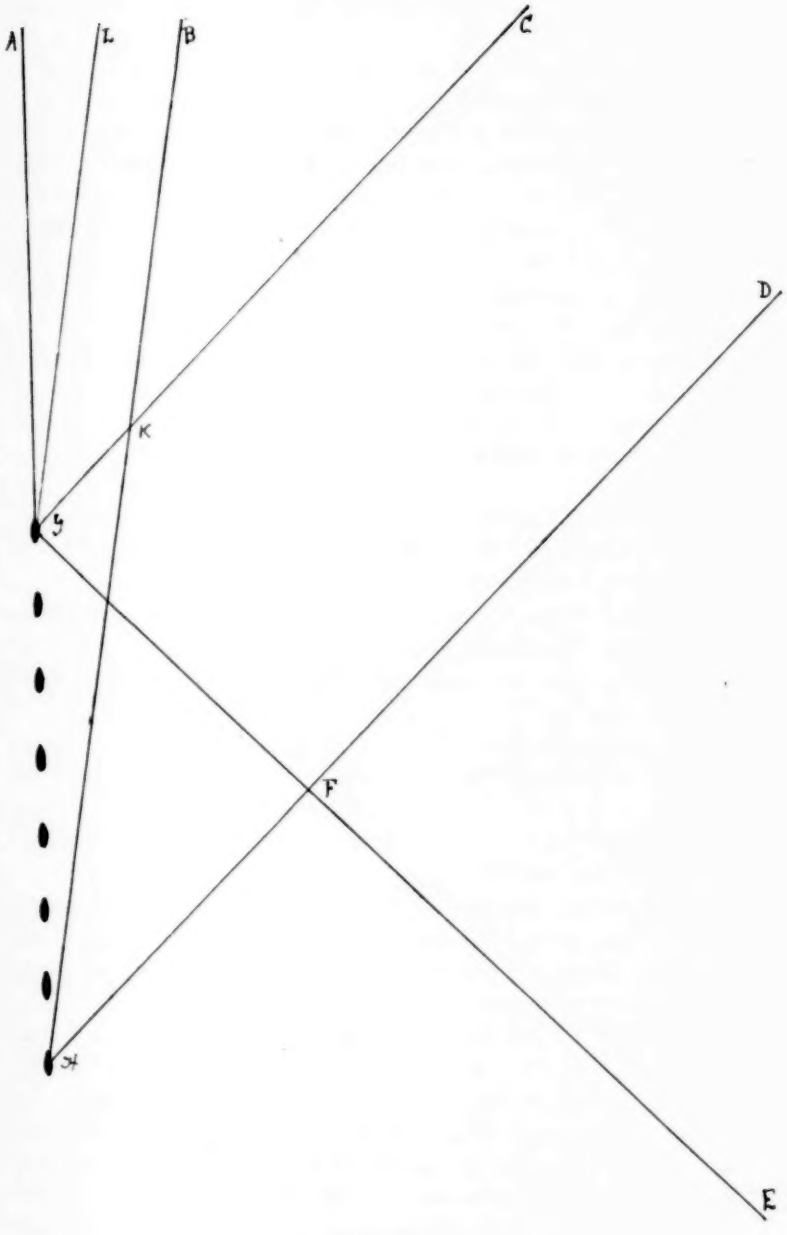


Plate II.

being disabled, the formation may be badly broken in attempting to avoid collision. The maximum gun fire can only be brought to bear through an angle equal and opposite to *GCK*, Plate III. This fire is delivered at a disadvantage, for unless the enemy is in a formation equally bad, his mean range to the end ship will be much smaller than the mean range of the ships in "line" to any enemy ship. From the diagram it will be seen that all ships bring their bow fire to bear on a target lying within the angle *DHE*. It will be noticed that this is the same angle as the maximum fire angle from column formation. Within the angle *DGC* part of the ships have bow fire and part broadside fire, the volume of fire increasing as the line *GC* is approached. Between the parallel lines *BI* and *CG* some ships will have their fire blanketed, the volume of fire diminishing as the line *BI* is approached. The angle *BIA* represents the half angle at that end through which only one ship can fire.

Line is a Good Formation for Approach or Retreat.—The bearing of the line should be, as nearly as possible, perpendicular to the direction of the enemy.

Line of Bearing.—When ships of a squadron are at a given distance apart, on the same course, with the guide on a line of bearing other than the course or 90° from the course, they are in "line of bearing."

As has been said, when the line of bearing is the same as the course the formation is column, and when 90° from the course the formation is "line." "Line of bearing" thus varies between "column" and "line." The case considered is "line of bearing" at 45° from the course.

The disadvantages of this formation are the same as have been given for line, though it will be seen that as the line of bearing approaches the course the gun fire value will be much increased until practically the same as for column.

Considering the line of bearing at four points from the course we refer to Plate IV. It will be seen that the broadside fire for all ships is limited by the position of the next ship. As the "line of bearing" approaches column, the angle *DFE* approaches 90°, and as the line of bearing approaches "line" the angle decreases. Between the parallel lines *CG* and *DK* fire diminishes as the line *CG* is approached. Within the angle *CLB* all ships bring their bow fire to bear. Between the parallel lines *BK* and *AH*, fire

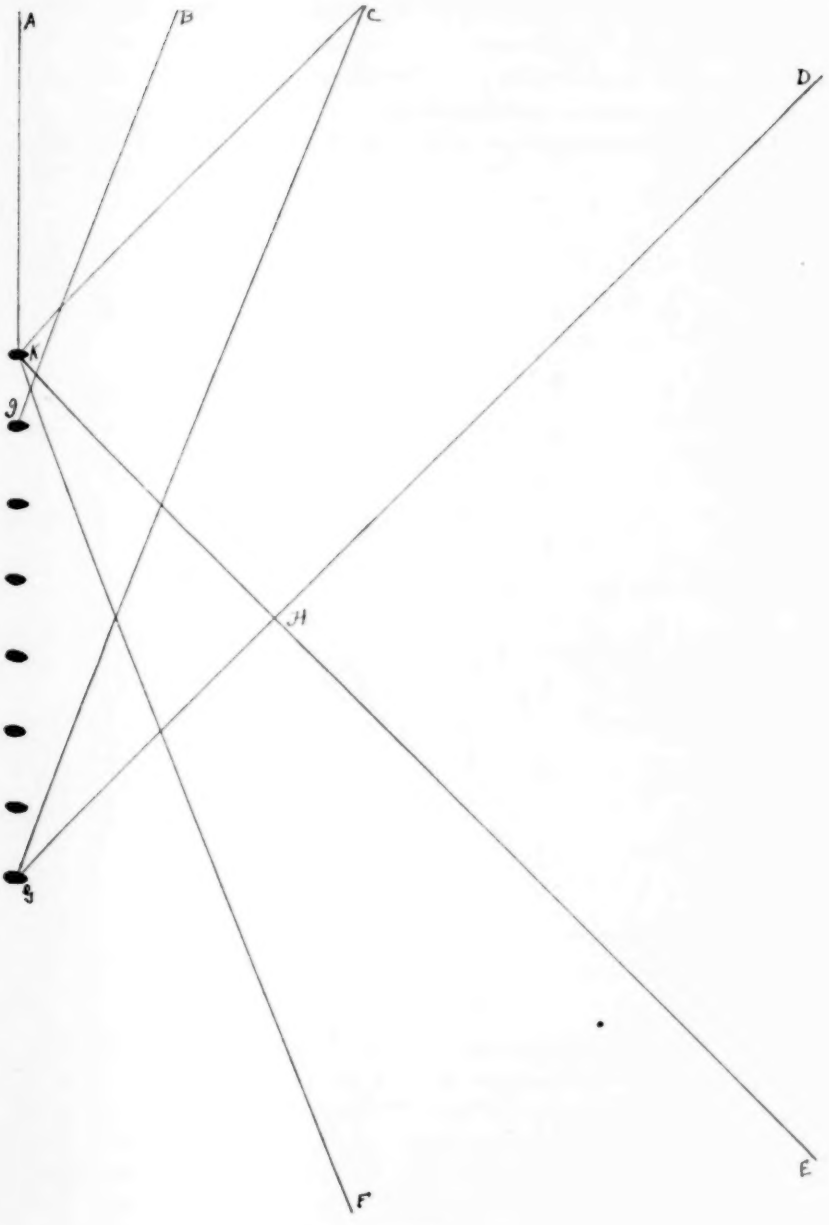


Plate III.

diminishes rapidly as one ship after another becomes blanketed. Within the angle *AHM* only one ship can fire.

"Line of bearing" is a good formation for approach or retreat, the line of bearing being perpendicular to the direction of the enemy. This formation will be seldom used during the engage-

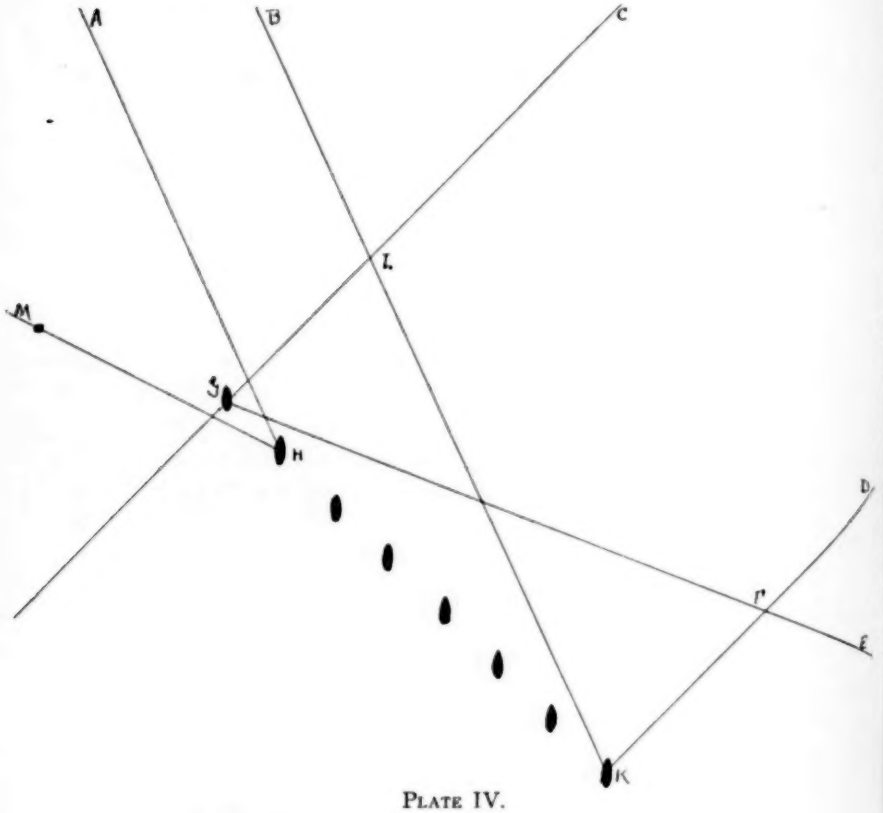


PLATE IV.

ment at medium ranges, on account of its inflexibility, except as an intermediate formation in swinging from line into column.

From a comparison of these diagrams we may note the most advantageous and disadvantageous positions of the target for each formation. The advantages for maximum gun fire are indisputably with column formation. Approaching the enemy on approximately opposite courses, enemy bearing ahead, "line" has the advantage. If the courses converge other than as above men-

tioned "line of bearing," with the line of bearing perpendicular to the direction of the enemy, has the advantage.

A thorough understanding of time and effect of changes of course or formation must be the foundation of naval tactics. We should therefore study the various movements and methods of performing various evolutions.

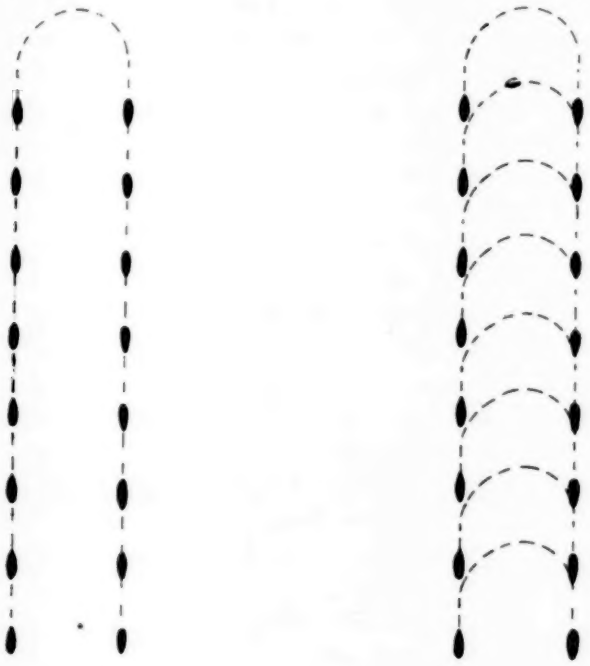


Plate V.

Passing from one formation to another is accomplished by successive movements, simultaneous movements, or both. A successive movement is one in which all ships perform the same evolution successively, or at the beginning of the movement perform the same or different evolutions arriving at their station in the new formation successively. A simultaneous movement is one in which all ships perform the same evolution at the same time, and arrive simultaneously at their station in the new formation.

As an example. "Being in column, to form column to the rear." The change by successive movement would require a countermarch, while the simultaneous movement would be "ships right about." Several considerations govern the choice of methods. The simultaneous movement reverses the order, changes the guide, and requires approximately 3 minutes and 45 seconds. The successive movement retains the order and guide, and requires approximately 9 minutes and 25 seconds. These times are for a speed of 15 knots. It will also be noticed that, if within gun range, the successive movement has the disadvantage of blanketing the fire of several ships during the movement. See Plate V.

In the more complicated changes of formation we will find it necessary to use both successive and simultaneous movements during one change. We will also find that the new formation may be taken by several different methods. These several methods have been defined by Commander Niblack as follows:

The Rectangular Method.—By the rectangular method a fleet goes from one formation into another by a series of simultaneous and successive movements, in which each ship performs the same evolution at undiminished speed, and in which the course and distance passed over are ultimately the same for each vessel.

The Direct Method.—By the direct method the guide or leader slows after the movement is begun, or the other ships use reserve speed, and the obliquing ships change course a certain number of points, reaching their new position by prescribed rules as to variations in helm and speed.

Special Methods.—By special methods the aim is to reach the new formation quickly.

It is now necessary to consider several evolutions performed by the three methods when all three are practicable. A speed of 15 knots is used as a basis for comparison.

Referring to Plate VI. Being in "line," to form "column" to the front.

1st. *By the Direct Method.*—The left ship advances on the original course at full speed, all other ships oblique three points to the left simultaneously at such speed as will retain their line of bearing until in rear of the leader; upon reaching this point each changes course to the original course forming column.

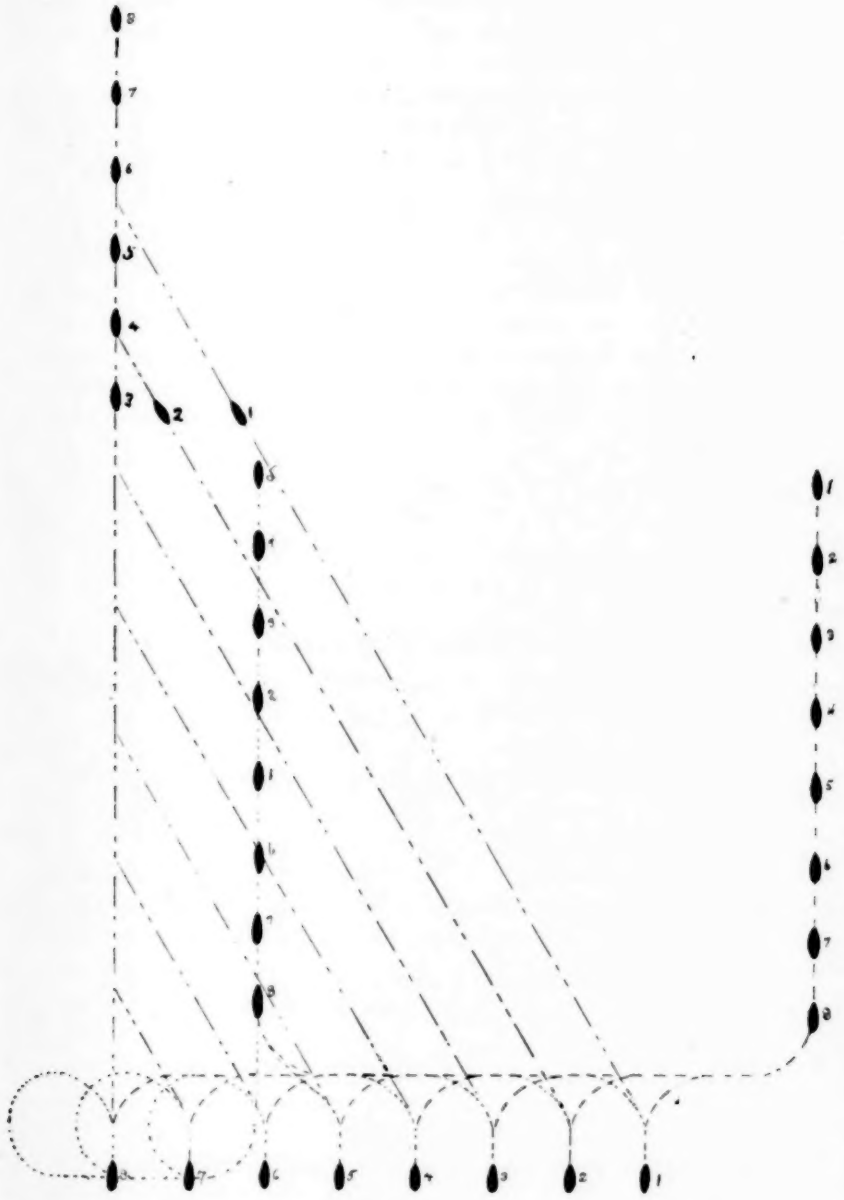


Plate VI.

Time: 13 minutes and 20 seconds. Distance gained to front, 8000 yards. To flank, same as left ship in previous formation. Gun fire of 7 ships interfered with for 3 minutes each.

Advantages: Gun fire less disturbed than by other methods.

Disadvantages: Time to perform. Length of time and great change of position of the squadron without any fixed formation.

2d. *By the Rectangular Method.*—"Ships right, column left."

Time: 9 minutes and 30 seconds. Distance gained to front, 3730 yards. To the flank, 870 yards to right of position of right ship in "line." Gun fire interfered with for 3½ minutes for each ship.

Advantages: Distance gained to flank. Less distance gained to front. Interference with gun fire less than with special method.

Disadvantages: Swinging of ships interferes with fire efficiency.

3d. *By a Special Method.*—The fifth ship from the right turns through four points to the left and then back to the original course. Nos. 4, 3, 2, 1, execute ships left and column right in time to follow in wake of No. 5. Nos. 6, 7, and 8, using reserve speed, execute ships 24 points left and column left in time to form column in rear of No. 1.

Advantage: Less time than other methods.

Disadvantages: Same as previous method and change of order and guide.

From these comparisons we see "*time*," "*distance to the front and to the flank*," and "*interference with gun fire*" are the three points for consideration in the adoption of the method best fitted to obtain the desired result.

We will now consider an evolution from column formation. "Being in column, to form column at right angles." Plate VII.

1st. The direct method is here replaced by a successive movement. "Column right." The leader changes course 8 points to the new course, each succeeding ship changing course in wake of the preceding one.

Time: 7 minutes and 20 seconds. Distance gained to front, 540 yards. Distance gained to flank 3130 yards. Gun fire interfered with 1¾ minutes for each ship.

Advantages: Least time required. Interference with gun fire least. Can be performed without signal if senior ship is leading.

2d. *Special Method.*—The Second Division performs column right at slightly reduced speed. The First Division, using re-

serve speed, ships left about, then column left forming in wake of No. 1.

Time: 8 minutes. Distance to rear, 1060 yards. Distance to flank, 3130 yards. Gun fire interfered with for 4 ships, 1¾ minutes each, and 4 ships, 6 minutes each.

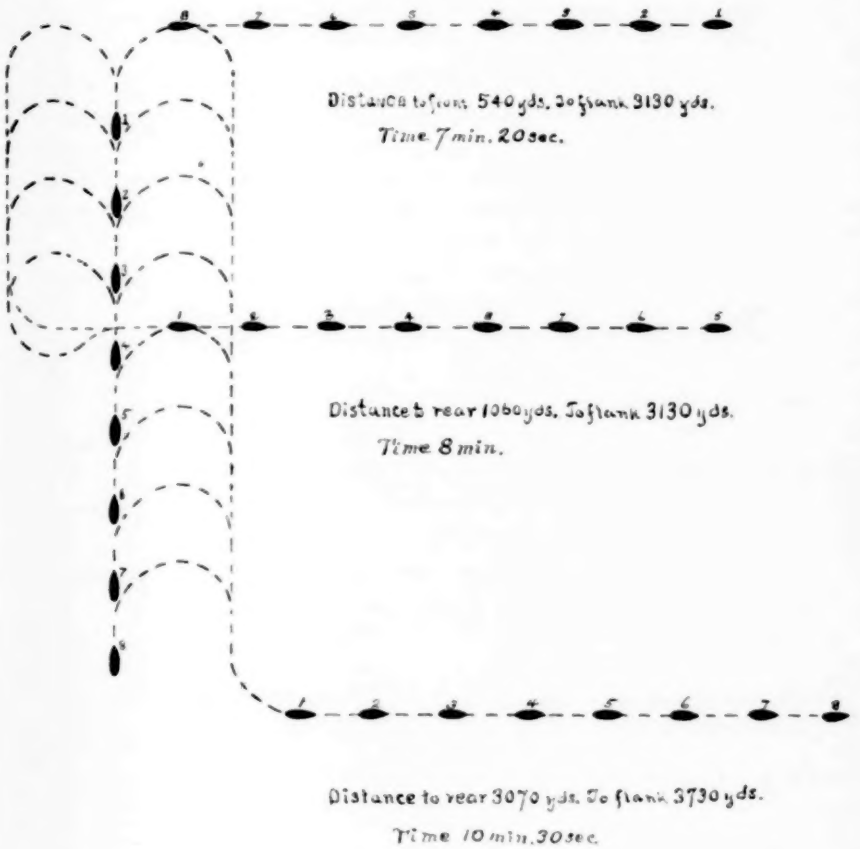

Distance to front 540 yds. To flank 3130 yds.
Time 7 min. 20 sec.
Distance to rear 1060 yds. To flank 3130 yds.
Time 8 min.
Distance to rear 3070 yds. To flank 3730 yds.
Time 10 min. 30 sec.

Plate VII.

Advantage: Distance gained to rear.

Disadvantages: Interference with gun fire, change of guide and order of ships.

3d. *Rectangular Method.*—"Ships right about, column left."

Time: 10 minutes and 30 seconds. Distance to rear, 3070

yards. To flank, 3730 yards. Gun fire interfered with about 5 minutes for each ship.

Advantages: Distance gained to rear.

Disadvantages: Time. Interference with gun fire. Change of guide.

One more example. Plate VIII.

"Being in column, to form line of bearing 2 points from the course."

1st. *By a Special Method.*—The leader slows to half speed, the rear ships take reserve speed. Each ship, except the leader, obliques to the right and regulates her speed and helm to reach the new position as soon as possible and to remain in position after it is reached. The leader resumes standard speed as the rear ship starts to swing to the left.

Time: 4 minutes and 20 seconds. Gun fire of 6 ships interfered with from 2 to 4 minutes.

Advantage: Least time.

Disadvantages: Interference with gun fire due to changes of speed and rapid changes of course.

2d. *Rectangular Method.*—"Column 2 points left," "ships 2 points right."

Time: 7 minutes and 15 seconds. Gun fire of all ships interfered with very slightly, if at all.

Advantages: No change of speed and small change of course. Interference with gun fire slight.

Disadvantages: Time.

3d. *Direct Method.*—The leader slows to three-quarters speed, the rear ships take reserve speed. All ships, except the leader, oblique three points to the right, changing course to the original course when they have gained the desired distance to the flank. The leader resumes standard speed as the rear ship is about to turn to the left.

Time: 5 minutes. Gun fire of 7 ships interfered with for 3 minutes each.

Advantage: More distance gained to the front than by the special method. Less time than the rectangular method.

Disadvantage: Swinging of ships interferes with gun fire.

If within range of the enemy, the method which interferes least with gun fire should generally be adopted. There may, how-

Form 2 point echelon.
Time 7 min. 15 sec.
Form 2 point echelon.
Time 4 min. 20 sec.
Time 5 minutes.

Plate VIII.

ever, be other considerations which make one of the other methods preferable. All movements possible should be studied in order to know the result of such movement as regards: "Time necessary to perform it," "change of position to front or rear and to the flank," and "interference with gun fire." A complete understanding of these results will aid materially in the choice of a manœuvre under various conditions.

Having discussed the formations comprised in "single line tactics," and some of the various movements in changing course or formation, we turn to the consideration of various formations when opposed one to the other or the same formations opposed under various conditions of course and bearing.

Before proceeding further it may be well to state two laws which govern the manœuvres of two squadrons within fighting range.

1st. The most advantageous position is in "line of bearing" with broadside fire bearing, with the line of bearing perpendicular to the direction of the enemy.

2d. As stated by Lieutenant A. C. Dewar, R. N., "Fleets within gun range, endeavoring to exert their maximum power of offence, tend to turn on to approximately parallel courses."

The offensive squadron will be constantly attempting to occupy positions fulfilling the first law, while the defensive squadron will be continually following the second law.

Considering the first law, it is evident that for the advantageous position to be of any great value, the courses of the two squadrons must be in the same general direction. The squadron having the advantage being in the lead, the courses must be parallel or converging. If in the rear, parallel or diverging.

The limiting case, with the squadron having the advantage in the lead, is represented by the original positions of the squadrons in Plate IX. It will be seen that both squadrons are in column, "A" crossing ahead of "B." "B" is T'd. How shall he manœuvre to equalize the positions in the least time? The solution given is but the opinion of the writer based upon results with the game board. The T'd squadron should make a column half right (in the direction of the T'ing squadron's rear). The reason for selecting four points is as follows: If "A" performs "ships right about" as soon as his signal can be made and answered after

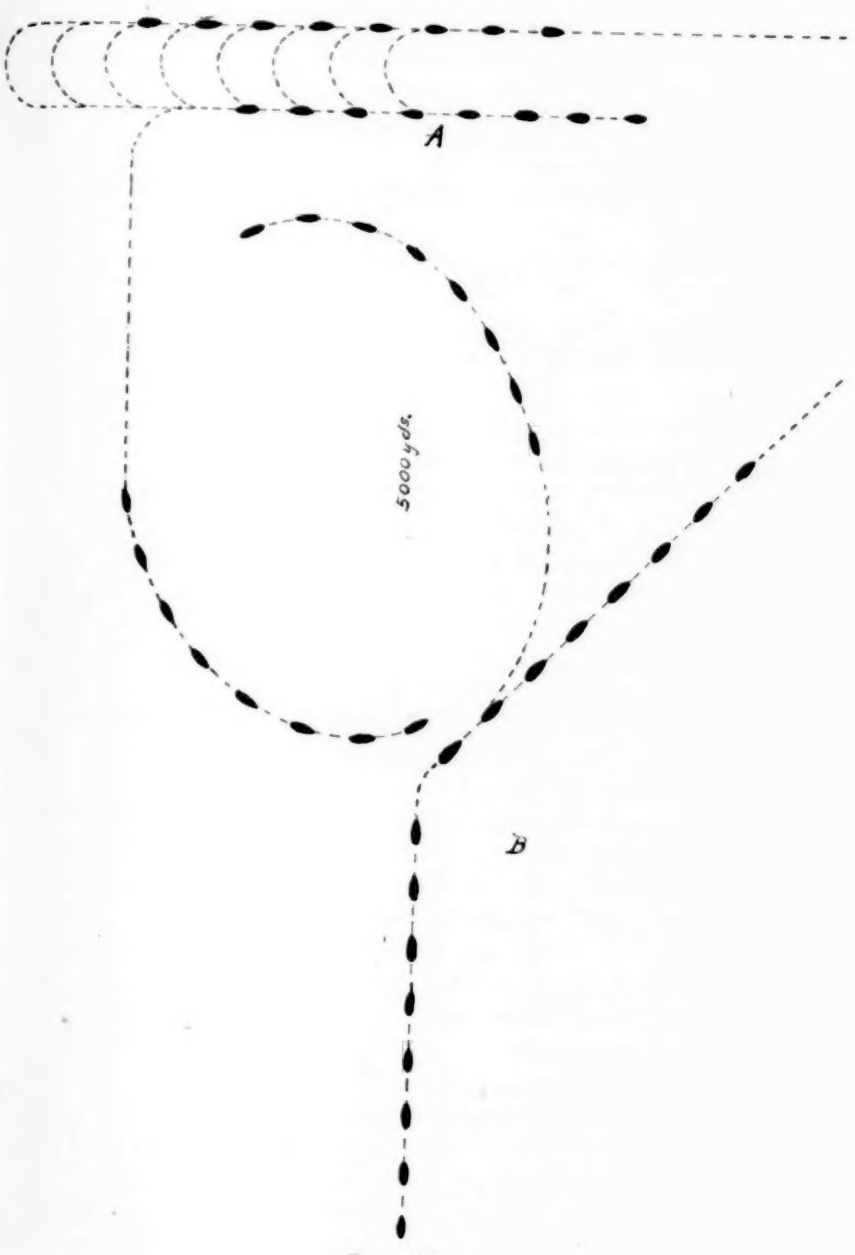


Plate IX.

" B " begins the turn, he can just meet " B " on equal terms. As shown by the diagram, if the lines representing the new courses be continued, it will be found that the two leaders are at approximately the same distance from the intersection. If " B " had made a smaller change, " A " would still have had an advantage, also " B's " broadside fire would not so soon have been brought to bear. If " A " proceeds on the same course, " B " will cap his rear. If " A " makes a column half left the advantage is equalized. If " A " makes a column left " B's " leader must keep " A's " rear ship four points forward of the beam. If " A's" leader does the same this will end in " chasing tails," or, as Lieut. Dewar has called it, " counter circling," shown by Plate IX. If " B " changes more than four points he loses any chance of taking advantage of any mistake that " A " might make, and also makes it necessary to swing through a greater angle to begin the counter circle in case " A " makes a column left.

The " Lock," as termed by Commander Niblack, consists of two positions, as shown by the following examples. Two squadrons, both in column, on converging courses, the course of one being nearly perpendicular to the bearing of the other. Fig. 1, Plate X. Two squadrons, one in column and the other in " line of bearing " with the line of bearing approximately perpendicular to the bearing of the column, on approximately the same course and slightly ahead. It is evident that for the instant this " lock " will be approximately the same if the locking squadron is on the quarter. The law of parallel courses gives the solution for the best method of breaking the " lock." Change the course of the head of the column to the course of the enemy or, if he is in " line of bearing " to his line of bearing. If the enemy was in column, he retains a lead, which case will be treated later. If he was in " line of bearing," he must parallel your course, or remain at a disadvantage, thus losing distance and equalizing the advantage. Fig. 2, of Plate X, ended with two squadrons in column on parallel courses, the leaders abreast. There can be no advantage to either in this position, and with equal speeds the squadron making a change of course or formation will do so at a sacrifice. If one squadron is faster it will gradually draw ahead. The leading ship of the slow squadron should always keep the leader of the fast squadron abeam, thus preventing any possibility of a cap and maintaining almost

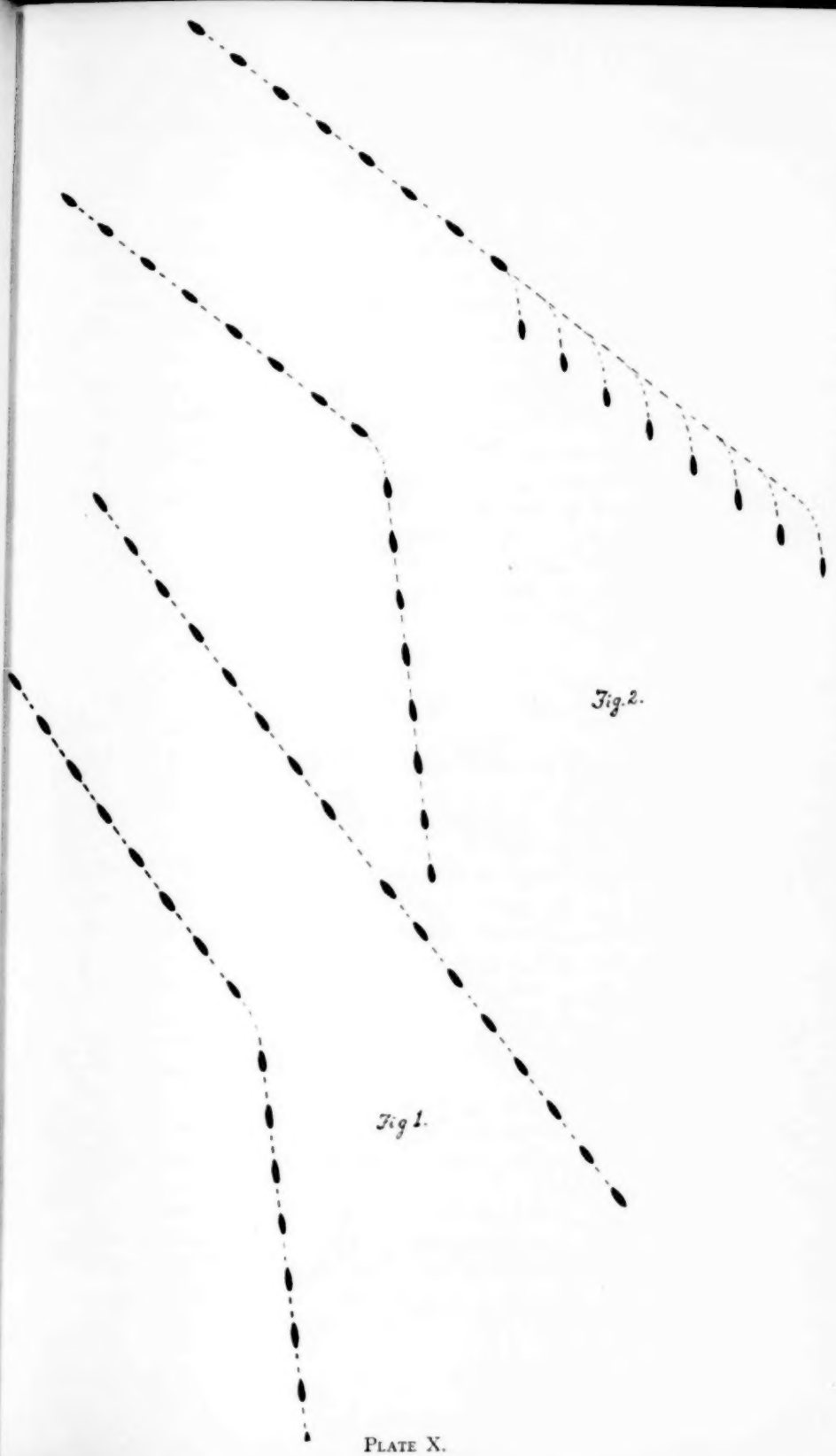


Fig. 2.

Fig 1.

PLATE X.

an equal advantage with the fast squadron. Referring to Plate XI, it will be seen that unless the fast squadron changes course he will soon be at a disadvantage if he is attempting to concentrate his fire on the leader of the slow squadron. It is probable that the fire would not be distributed in this manner, but considering "A's" first division concentrating on "B's" leader, the other ships firing at the nearest ship and vice versa, "B's" second division concentrating on "A's" rear, the mean ranges are still changed almost in the same proportion given in the diagram. "A," upon seeing that "B" is easing off, may keep the range as it then is by taking "line of bearing" on a course parallel to "B's." This is a disadvantage, as the advantage of range lies with "B," until "A" again draws ahead. The same considerations apply to the case of two squadrons of equal speed on parallel courses one slightly ahead of the other, except that once having lost the advantage it cannot be regained unless the enemy makes a mistake.

Plate XII shows two columns approaching on converging courses approximately opposite. "B" sees that if he continues on this course "A" will cap him, he therefore changes course away from "A" to such course as will pass ahead of "A" if "A" continues his present course. Each one will make a change of course time after time until they are on approximately parallel courses. If "B" should see that he could not pass ahead of "A," he might change course to 180° from "A's" course, the columns would then pass on opposite courses. As each leader would keep the rear ship of the other column abeam, or, if desiring to close the range, four points forward of the beam, this would end in counter circling. There should be no advantage of position if the speeds are equal.

The foregoing examples have been those that will be most frequently met with during the engagement at medium ranges. We must now consider the approach and the retreat. As has been said, column is the best formation for the engagement at medium ranges and "line" and "line of bearing" for the approach and the retreat.

Approaching in column is at variance with our first law of position. It is an inferior position for approach, as some ships may be blanketed, and if the enemy is in "line" or "line of bearing," the mean range of the ships in column to any ship of

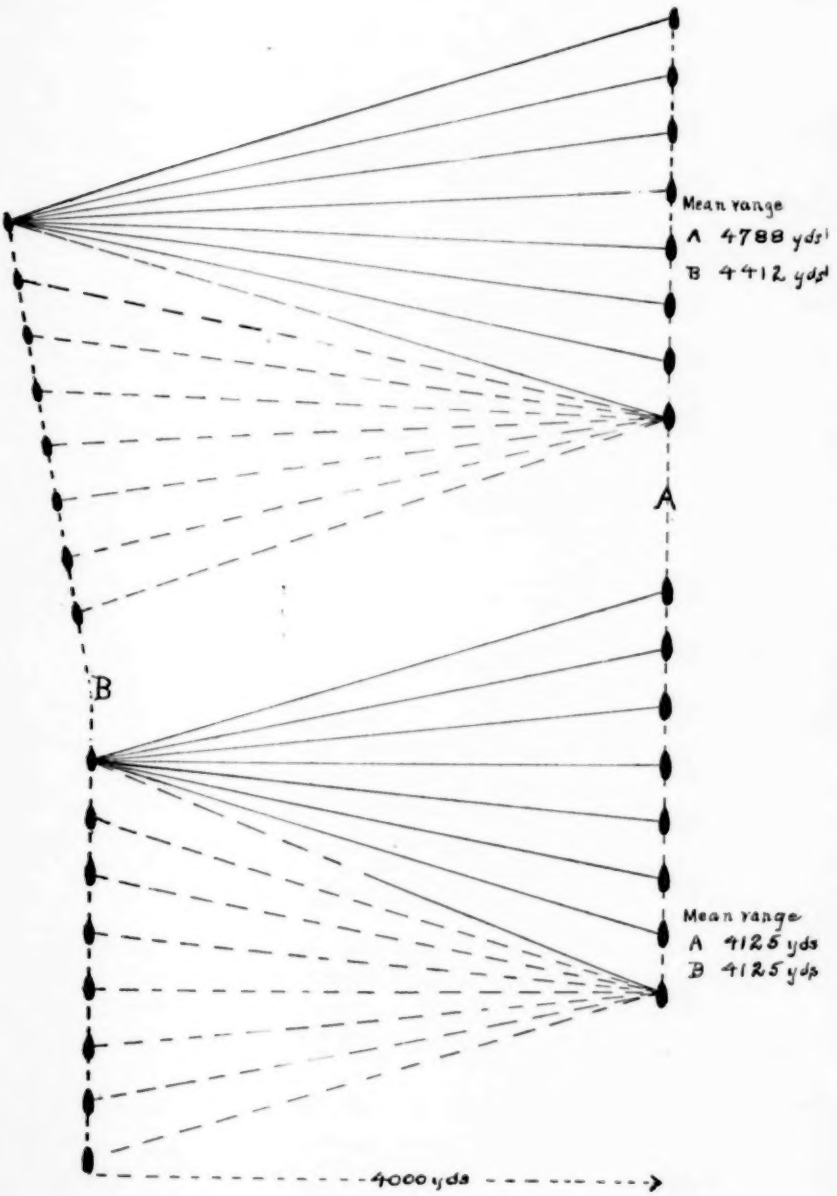

Mean range
A 4788 yds
B 4412 yds
A
B
Mean range
A 4125 yds
B 4125 yds
4000 yds

PLATE XI.

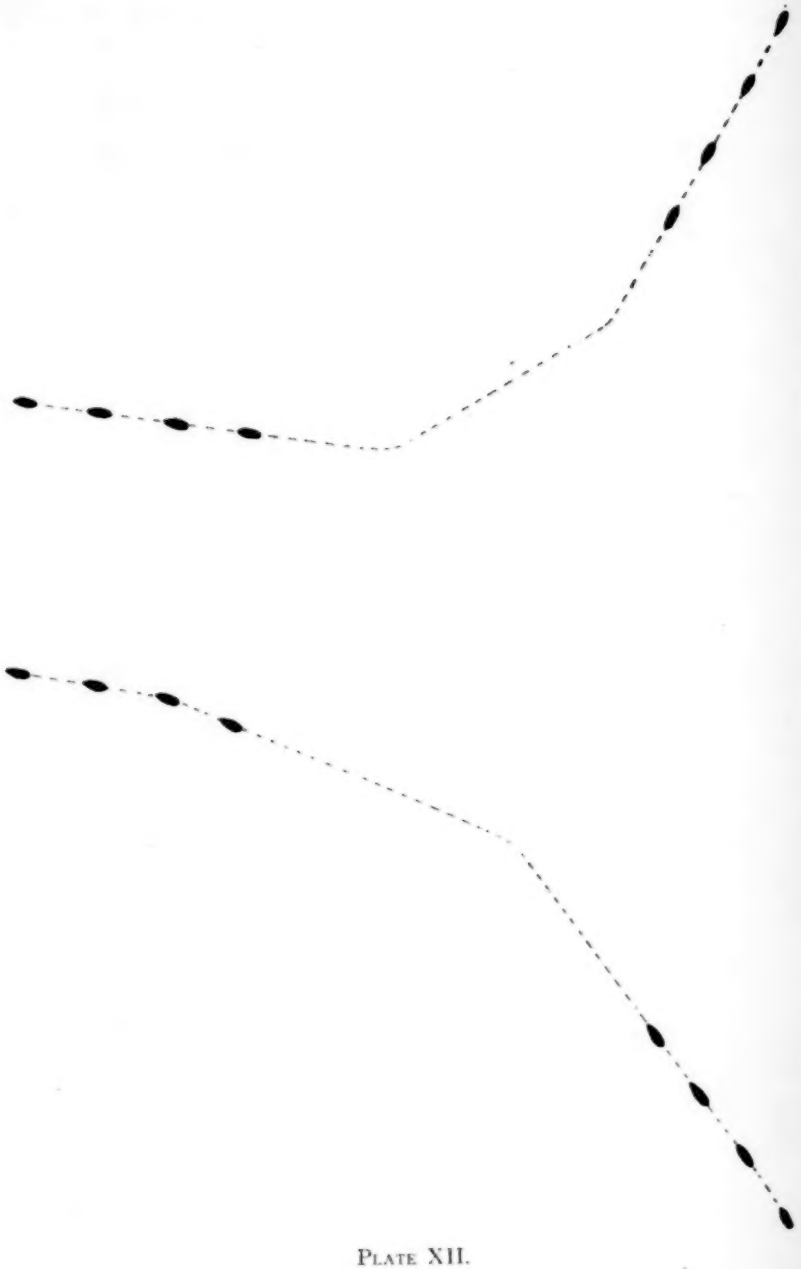


Plate XII.

the "line" or "line of bearing" formation is greater than their mean range to the leader of the column.

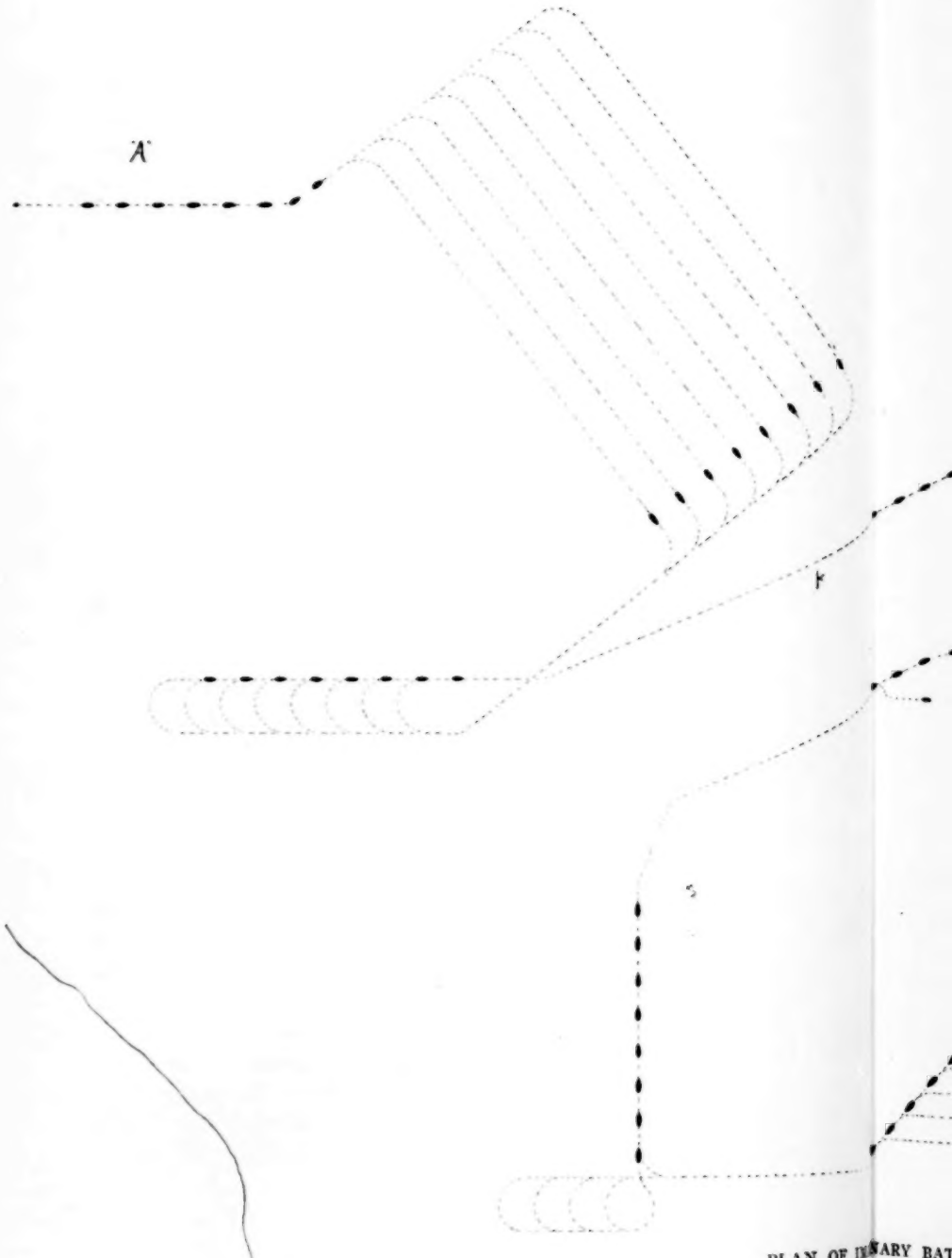
In obeying the first law we must approach in "line" or "line of bearing" with the line of bearing perpendicular to the direction of the enemy. When the desired range is reached, column formation should be taken in the direction that will give an advantage of position. Following the law of parallel courses, the enemy must swing onto a course approximately parallel or remain at a disadvantage. We must bear in mind that if the enemy changes course or formation first we must not delay paralleling his course unless we have the advantage of position. In the retreat we must take "line" or "line of bearing" on a course that will bring us first to a protecting harbor or superior force. In pursuit the formation should be "line of bearing" or "double line of bearing," as shown by the arrangement of stars below.

Following directly astern of the enemy must be avoided on account of the danger from floating mines. The range must also be frequently compared with the torpedo range card (mentioned below) to make sure that with the enemy on the known bearing we are not within torpedo range.

The Engagement.

In this plan of an imaginary engagement, the writer does not contend that each move he has made the contestants make is the best one under the circumstances, although as long as these moves can be conceived to have been made, we may discuss it as an example.

The squadron "B" is supposed to be attempting to force a passage between the islands shown in the diagram. Upon entering the passage an enemy's squadron is seen at the opposite end of the passage. "A" squadron is soon seen changing course away from "B." "B" changes course four points to the left to



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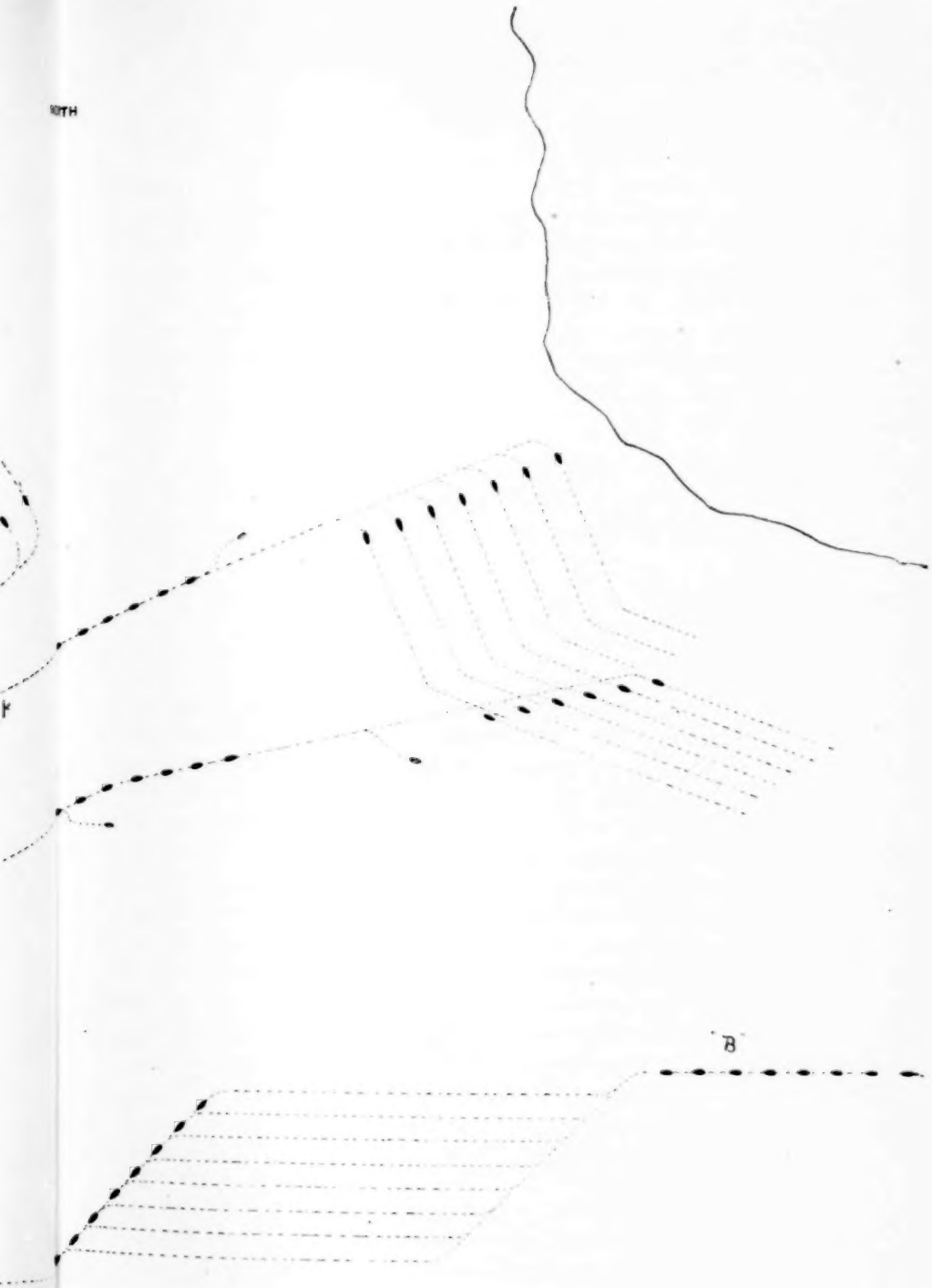

OF IMAGINARY BATTLE.

gain position for forming line of bearing. "A" forms line perpendicular to the bearing of "B." "B" forms line of bearing on course west, attempting to pass "A's" right flank.

When the range is reduced to 7500 yards, "B" swings into column, ships half left and the head of column immediately changes course to west. Upon seeing "B's" change of formation, "A" swings into column showing our first example of the law of parallel courses. "A" could not afford to approach "B" with only bow fire bearing while "B" was using broadside fire. "A" realizing that he cannot cross ahead of "B," changes course to west, in order to cap "B," should "B" change course to the northward.

"B," seeing that it is impossible to cross "A's" bow, tries to pass astern of "A" by forming column at right angles by a special method. "A" is on the alert, and as soon as his column is straightened out, performs ships right about. Again, we find both sides changing course for a chance of capping with the usual result that they end by taking parallel courses.

A lucky shot puts "B's" No. 5 out of action, and he is forced to leave the column, sheering out of formation away from the enemy in order to avoid blanketing the ships astern of him in the column while passing him. This decreases "B's" lead 400 yards.

"B's" No. 6 finds the enemy concentrating their fire on him, and, in order to increase the range, eases away a point. "A's" No. 8 is disabled, and soon after "B's" No. 1 is forced to leave the formation. As the eastern shore is approached, "A" now having a superiority, swings into line to close the range. "B," however, decides to withdraw. He assumes line of bearing on the course that will bring him most quickly to a sheltering port. "A" continues line until astern of "B" when he assumes line of bearing on the same course as "B."

The object of this sketch is not so much to show what should be done in each case, as to show the conditions which may make such movement seem best, and also the method of performing the various evolutions.

The Approach.—In the plan we have shown two methods of approach "line" and "line of bearing." Both are good formations for approach. "Line" is the most valuable when the courses of the approaching squadrons are nearly 180° apart, and "line of bearing" when the angle between the courses is other

than as above. It will be seen that when fire is opened all ships of "B" squadron can bring broadside fire to bear, while "A" is forced to use bow fire until he swings into column. "Line of bearing" must be used discreetly and left at the proper moment, or it may prove a detriment instead of an advantage.

"B's" adoption of the special method is due to his desire to gain distance to the right and rear, in order to pass astern of "A." "A," however, is too quick, and "B" is forced to parallel "A."

The retreat and considerations have been mentioned above.

The Weather Vantage.

The weather gauge was considered of great value in the days of sailing ships, but until recently has lacked consideration regarding its application to modern conditions.

Let us consider the effect of wind on modern gunnery efficiency. In firing to windward the gases and fumes from the burning smokeless powder are blown back into the turrets and gun ports for the broadside battery. These gases not only tend to obscure the target, but interfere seriously with the pointer. The writer has seen on a single run, firing a turret to windward, the fumes so dense in the turret that at the end of the run the pointer's eyes were so affected that they were filled with tears, and his eyesight dimmed so that he could not have continued longer at his station. If there is any sea running, spray will be blown against the lenses of the telescopic sights, especially of the broadside battery. It is also harder on the observer's eyes to look to windward than to leeward.

In firing to leeward no spray will strike the lenses, and although the effect of the gases in obscuring the target may be as great, the gases will be driven from the ship instead of into it.

The effect of the gases in obscuring the target will mostly be dependent upon whether the wind is forward of, or abaft the beam. In case the wind is forward of the beam, the gases will pass in front of all guns abaft the one firing, but with a velocity equal to the sum of the speed and the component of wind velocity opposite to the course. If the wind is abaft the beam, the gases will remain longer in front of the guns, for the speed of passing will then be the difference between the speed of the ship and the

component of wind velocity in the direction of the course. It is evident that when this component of wind velocity is greater than the speed the gases will move forward.

So much for the wind.—Now for the sea. With modern methods of aiming, it is well known that the rolling of the ship seriously interferes with the accuracy of gun fire. The best position for the sea, then, must be the position in which the ship will roll the least. This is ahead. As the sea draws abeam the rolling increases. As the sea approaches the quarter or stern the rolling decreases, but causes the ship to yaw more or less, which motion, being very irregular, is worse than either rolling or pitching alone.

Considering the direction of the wind and sea to be approximately the same, as under general conditions it is, what conclusion can we reach regarding the best position for the wind and sea. From the consideration of the effects of wind and sea, as mentioned above, the writer concludes that the best position for wind and sea, considering them together, is slightly on the bow away from the enemy. If this is true, we find the weather gauge, or weather vantage has changed materially from its old meaning. It is also evident that two squadrons steaming on converging courses may both have the wind in its most favorable position. While this position is the best, we must not lose sight of the fact that it is better to fire to leeward than to windward, and better to have the wind forward of the beam than abaft it.

With sailing ships the weather gauge was equally as great with a light breeze as with a strong breeze, but with modern ships the advantage will be proportional to the strength of the breeze and height of the sea. A light breeze abaft the beam, however, may be very detrimental to rapid shooting, as the gases will hang over the ship interfering with the visibility of the target.

The Sun Gauge.—The glare of the rising or setting sun upon the water is so strong that few eyes can look continuously at the horizon, within several points of the bearing of the sun, for several hours before sunset or after sunrise. If the bearing of the enemy approximates to that of the sun, the value of gun fire and spotting is greatly reduced. Colored shade glasses will no doubt be of great assistance, but even then the burden of proof will be with the squadron that is obliged to use them.

It should, therefore, be the object of a squadron to keep the enemy on a bearing 180° from the azimuth of the sun. This

applies especially when the sun is near the horizon. This may necessitate giving up the weather vantage, but, except in case of a heavy sea, the writer is of the opinion that the sun gauge is preferable. An excess of speed is necessary to retain this advantage for any length of time.

When in range of the enemy there are several other points relating to gun fire efficiency that must be considered before deciding upon a change of course or formation, and, after the decision is made, in determining the method to be adopted in performing the evolution. These may be enumerated as follows: 1st. Change of target. 2d. Change of speed. 3d. Change of range. 4th. Interference with gun fire

The first is, perhaps, the most important. Having found the range for one ship, it will be possible to approximate very closely to the range at any other instant as long as fire is continued at the same ship. If we change our formation so that our fire must be directed at another target, we are obliged to start all over and determine the range and change of range. It should, therefore, be understood that the target selected, unless otherwise ordered by signal, should be some ship in the enemy's squadron, whose mean range will be the least, not at just the instant, but just as long as there is no change of course or formation. The same target should be used continually, unless a change of formation makes it impossible, or a difference in speed or course makes the difference in range between the one being used and a nearer one very material. Frequent changes of target will have a serious effect upon accuracy and efficiency of gun fire.

2d. Changes in speed should be avoided, for a change of speed requires a change of the sliding leaf, and it is impossible to tell the exact speed of a ship while slowing down or increasing speed. The effect of this, however, will be very small as compared to changes in course or formation which change the rate of passing the enemy. As the scale on the sliding leaf indicates the deflection for a target passing perpendicular to the line of fire, the deflection necessary will change greatly during an evolution or change of course, which requires a change of more than two points. Consider two squadrons on parallel courses, leaders abreast, speeds equal, 15 knots. The sliding leafs will be set at 0. If, now, one squadron performs ships right, the sliding leafs will have to be changed from 0 to approximately 15 knots, during the

minute and 45 seconds it requires for that change of course. It is evident that with such rapid changes the accuracy will be greatly reduced.

The third consideration is partly included in the second. Changes of course or formation which change the range have also the disadvantage of requiring a new change of range to be found. This will interfere with the accuracy of fire during the time it takes to determine the new change of range.

4th. Interference with gun fire due to swinging. It is evident from the discussion of the second consideration, that the sliding leaf must be rapidly changed, also the guns must be trained at nearly the maximum speed, interfering with accuracy. The heel accompanying the swinging of a ship also tends to interfere with the accuracy of fire.

Concentration.

The word concentration has been extensively used in recent writings on naval tactics, to mean that all ships of a squadron were concentrating their fire on one ship of the enemy's squadron. The word has been used several times in this article with the above meaning. It must be said, however, that this concentration of fire does not seem logical to the writer except under special circumstances.

Napoleon's greatest victories were due to concentration, but concentration of forces, and not of fire when equal forces were opposed. No one will doubt the advantage of concentration of forces, but concentration of fire, when equal forces are opposed, does not seem logical. If two ships are opposed to one the advantage is evident, but if two are opposed to two would we still fire at only one?

Let us consider two armies drawn up in line of battle. Can we for an instant suppose that the fire of one line would be concentrated upon one portion of the enemy's line, leaving the greater portion of the enemy's line undisturbed to manœuvre and fire without being under fire. Admiral Farragut said the best protection against gun fire was a rapid and well-directed fire. Does not the same thing apply to-day?

Consider two equal squadrons, both in column, on parallel courses, leaders abreast. One squadron concentrating their fire on the enemy's leader, the other squadron with each ship firing

at the corresponding ship in the other column. Where will the greatest efficiency of fire lie? Will it be with the squadron, every ship of which is under fire, or with the squadron only one or two ships of which are under fire? It does not seem that any one will say with the squadron all ships of which are under fire. This, then, is one point against concentration. The fire efficiency of a squadron is reduced proportionately to the number of ships of the squadron actually under fire.

Now we must consider the effect. Is our first object to disable or to sink the enemy's ships? The surest chance of victory is to speedily disable the enemy's ships, later returning to sink or destroy them.

Does the chance of disabling a squadron seem better by concentrating on one ship and then on another, or by firing at each ship or as many as possible?

On the game board the damage is proportional to the amount of fire received, but will this always be true in actual battle? There is no doubt that a ship will receive more damage the longer she is shot at, but in all probability the same result, as to her efficiency, might have been obtained by less fire. With range finding stations, turrets and conning-towers as vital spots for disabling shots, is it not better to be firing at several on each ship than several on one ship only? The lucky shot is just as apt to be first as last, when only one shot is considered. Even considering that the damage done to one ship, by concentration, reduces the value of the squadron as much as the smaller amount of damage done to several when not concentrating, we still have the point previously mentioned in favor of not concentrating. There are still other conditions to examine.

Will the commander-in-chief have time to direct the fire of each ship? Would not the number of signals be excessive? An unexpected change of formation by the enemy would, in many instances, make it impossible to carry out the order of the commander-in-chief, or in order to do so, we would fire at a ship at a much greater range than that to the nearest enemy.

How, then, can we approach to a method under which concentration will only be used when the conditions are favorable, and make the ship concentrated upon the best target for the ships concentrating.

The three important points to consider in selecting a target are: The range, the change of range, and the probable length of time the target will remain favorable.

Who is the best judge of the above conditions? It is the writer's opinion that the fire control officer of each ship should be the best judge of these conditions for the ship he is on, and on him should be placed the responsibility of picking the target that will best satisfy these conditions. If one target can be used for some time, the change of range will be more accurate, hence the range will be more accurate. The target should, therefore, be picked with this in view. Though it may not be the nearest ship at the time, it may be so soon and remain so longer.

In order to do this the fire control officer must be thoroughly familiar with the tactics of the commander-in-chief, and must duly consider the chances of a change of course or formation. If this is done concentration can only occur when one enemy ship appears as the best target for several ships, which will only be when the concentrating squadron is in a superior position or on parallel courses with the enemy in the lead, in which case the rear ship of the enemy's column will be the best target for several ships at the rear of the column. This approaches to a concentration of forces, though less so in the last mentioned case than in any other. If each ship is firing at the best target it is a logical distribution of fire.

Now let us turn to the Battle of Tsushima. We find it reported that the *Osliaba* was the first ship to suffer severely, the reason given being, that she was stopped. Does it seem reasonable that it was easier to hit a target that was stopped than one proceeding on a parallel course at a few knots less speed? When the Japanese countermarched, what ships of the Russian column were the logical targets? It would seem that, knowing their superiority of speed and the chance of drawing ahead, the Japanese First Division would take the Russian leader as their target, while the other Japanese ships would take a ship in the Russian column about four nearer the head than their own corresponding number in the column.

Theory usually considers all ships as equal, whereas the *Osliaba* was probably the strongest ship after those of the Russian First Division. It is therefore possible, in fact probable, that the Japanese First Division took the *Suvaroff*, and the other ships

the *Osliaba* as a target. As the Japanese squadron drew ahead they all concentrated on the Russian leader. But why? The Russians in failing to parallel the course of the Japanese ships gave the Japanese a position of great advantage, and the range to the Russian leader was the smallest for every Japanese ship, and continued to be so until the Russians turned away.

At 2.30 p. m., the Russians turned away, the head of column changing course to the eastward, and we are told that the Japanese concentrated on each ship as it turned the knuckle. If they did they certainly wasted some good ammunition, for by the time the fifth ship reached the knuckle the range of the *Mikasa* to the knuckle was 1500 yards greater than her range to the Russian leader, the *Alexander III.*

Is it not more probable that the Japanese First Division continued to fire at the leader while the other Japanese ships, having lost the superior position, due to the Russians having changed course, picked up another ship as its best target. If these ships confined their fire to the first five ships, it might well have seemed to each of these Russian ships that she was receiving the fire from the entire Japanese squadron.

The inefficient handling of the Russian squadron and still more inefficient handling of their guns, has given us little to consider regarding the result of the concentration of gun fire. We are told that the Russian commander-in-chief ordered fire to be concentrated on the *Mikasa.* If this was obeyed it is little wonder that no further damage was done to the Japanese ships.

In the foregoing consideration of various positions of advantage only gun fire has been considered as effectual. There are, however, several other instruments of offense and defence which we must consider before reaching a final conclusion; namely, the automobile torpedo and the floating mine.

We may consider the automobile torpedo as having a maximum range of 3000 yards. Floating mines discharge upon contact. The Hague conference voted that floating mines must be so constructed as to be inocuous one hour after control over them is lost. This, however, has not yet been agreed to.

The automobile torpedo must be considered from two points. Those fired from the ships of the battle line and those fired from torpedo boats, or destroyers, accompanying the squadron.

We will first consider those fired from the ships in the battle-line. It is assumed that an automobiie torpedo of the latest type can average 28 knots for a run of 3000 yards. Two equal squadrons will, in all probability, never close to a range of 3000 yards, but under certain conditions we find that the actual distance between the ship firing the torpedo and the target ship may be much greater and still make a hit. This range may be as great as 4600 yards if the target ship is making 15 knots, and as great as 5050 yards if she is making 20 knots.

Plate XIII shows what may be termed a torpedo range card. This one is constructed for a speed of target of 15 knots, and speed of torpedo 28 knots average for 3000 yards. ⬮ represents the ship firing, ⬮ the target ship, ◊ the position of the target ship where the torpedo, if properly aimed, would strike the ship.

It is evident that the course of the firing ship need not be considered, as with modern torpedoes the direction of run can be set no matter what the direction of the tube at the time of firing. The use of this card will be to find the least range to which you can close without any chance of being torpedoed.

If the firing ship is directly ahead of the target ship and the target ship continues her course, the torpedo and target are moving toward each other, and, as the torpedo runs 3000 yards in 3¼ minutes, and in the same time the target advances 1625 yards, it is evident that, although, at the instant of firing, the range was 4625 yards, a torpedo having a 3000-yard radius of action will be able to make a hit if properly adjusted and aimed.

Let us consider one more case. The bearing of the enemy is four points from our course. The range at which it is possible that we may be torpedoed is the distance on this bearing to a point such that, a line equal in length to the run of the target during 3¼ minutes, laid in the direction of the course, just touches the circle drawn, with a 3000-yard radius, with the position of the firing ship at the time the torpedo was fired, as a center. In this case we find, from the torpedo range card, 3920 yards,

From the cards it is seen that the range, speed, and difference between the bearing of the enemy and our course, are the points to be considered in determining the possibility of being torpedoed. It may be stated here that it is much easier to tell when there is any chance of being torpedoed than when there is a chance of torpedoing an enemy. In the first case you know your own course

which is a determining factor, while in the second case the enemy's course can only be approximately known.

The maximum range is 4625 yards, when the target is moving

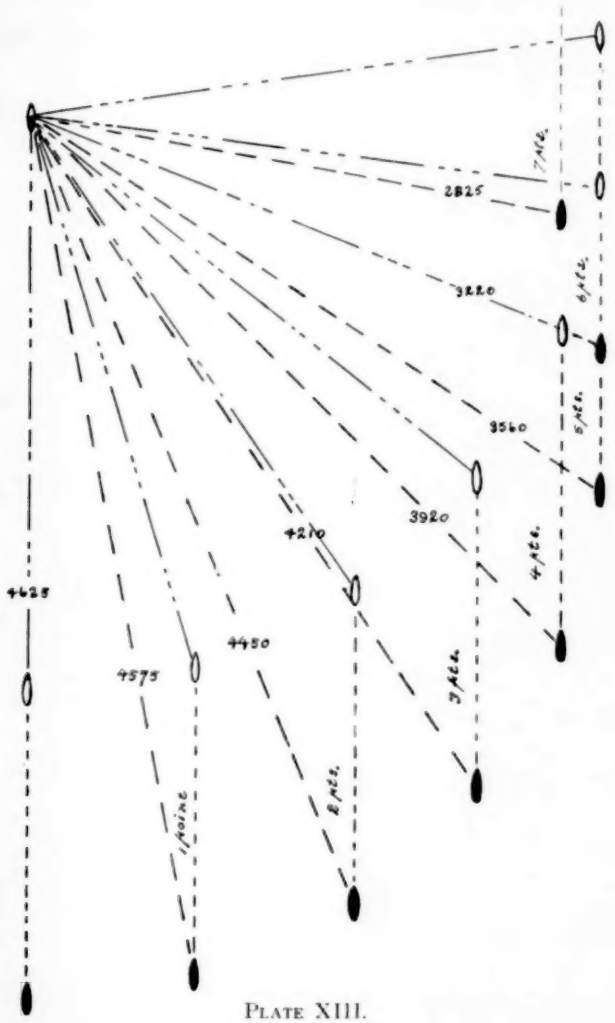

Plate XIII.

directly toward the firing ship at the instant the torpedo is fired, and does not change course. The minimum range is when the target ship is moving directly away from the firing ship, this range is but 1375 yards. As shown by the torpedo cards the

range varies, decreasing as the bearing of the firing ship and the course of the target ship become further and further apart, when the difference is 180° the range is a minimum. Plates XIII and XIV show two methods of constructing these cards. Plate XIII considers the target in various positions, and Plate XIV, the firing ship in various positions.

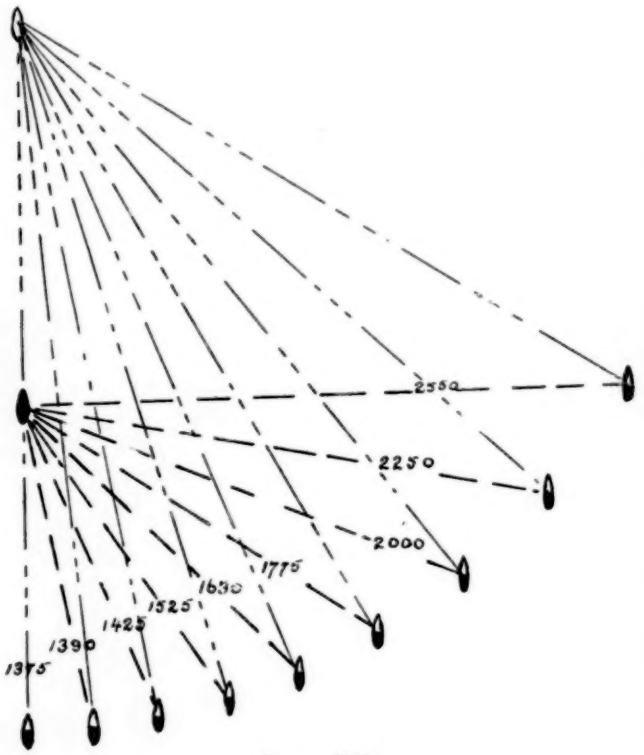

Plate XIV.

It will be noticed that two ships abeam of each other must be nearer than 3000 yards for torpedoes to be effective.

What new idea does this comparison of ranges for different bearings bring forth? Referring to Plate XV, we see a squadron in column, and on the bow and quarter of this column two squadrons in "line of bearing." The position of either squadron in "line of bearing" is preferable to the column if only gun fire is considered. Considering torpedoes, however, we find that it

PLATE XV.

is possible for two ships of the column to torpedo either of the two left ships of the "line of bearing" on the quarter. As none of the ships of the line of bearing on the quarter can torpedo any ship of the column, they are at a disadvantage. How can they avoid this disadvantage? By the use of the torpedo card knowing her course and bearing of the enemy, the minimum range to which she may approach, without a chance of being torpedoed, may be found by each ship. The speed or course must be changed until the range, corresponding to the maximum torpedo range for that bearing, is exceeded.

Considering the "line of bearing" in the lead we find that it is possible for five ships of this "line of bearing" to torpedo some ship in the column, while none of the ships of the column can torpedo any ship in this "line of bearing." These examples show the great advantage in keeping ahead of the enemy. The consideration of torpedoes augments the value of all superior positions except the "T" and the "lock" on the rear of a column. It seriously decreases their value at ranges less than 4500 yards. The shorter the range the greater the decrease in value.

So far we have considered only torpedoes fired from ships of the battle line. It is becoming a recognized fact that the best protection for a battleship squadron against torpedo attack is a flotilla of destroyers. This flotilla having become an appendage to the battle fleet, what are we going to do with them in an engagement?

If we should meet an equal or inferior squadron with no destroyers, we would no doubt order our destroyers to remain out of range until some enemy ship having become disabled they could finish the work by a concentrated attack. Suppose, however, that the enemy is superior in destroyers. If we order our destroyers out of range they will be attacked by a superior force.

How then can we keep them out of danger and ready for use? The German Navy seems to have adopted a plan of protecting them by using the battleships as screens. Plate XVI, Fig. 1, shows a column of eight ships with six destroyers under fire of a column of eight ships. The dotted lines represent the limits of fire passing each battleship. From this we see that a battleship 500 feet long can protect a destroyer 275 feet long, provided that the destroyer keeps within 100 yards of the battleship. This is only true of such projectiles as have so flat a trajectory that the

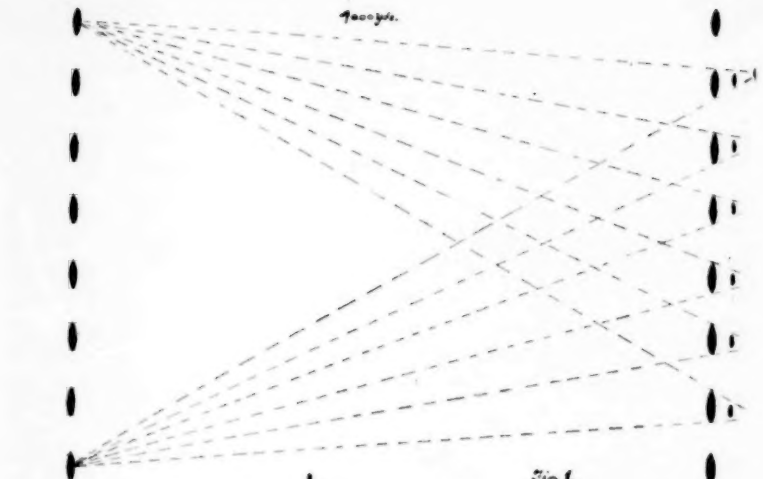

Fig 1.

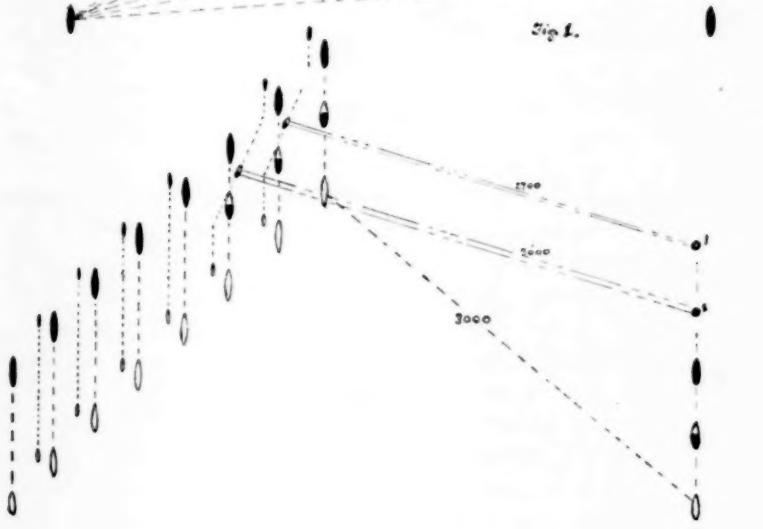

Fig 2.

PLATE XVI

danger space of the battleship is as great or greater than 100 yards. As the chances of hitting a torpedo-boat-destroyer at ranges over 5000 yards are small, it might be well to keep them at 1000 yards' distance from the battleships until a range of 5000 yards is approached, when they would take position 100 yards from their protecting battleship.

That destroyers may augment the advantage of the superior position is shown by Fig. 2, Plate XVI. The destroyers are shown protected by battleships Nos. 2, 3, 4, 5, 6, and 7, Destroyers Nos. 1 and 2 are ordered to shift to battleships Nos. 1 and 2, respectively. In so doing they are in sight of the enemy during approximately 1¾ minutes, supposing their speed to be 20 knots. During this change they can fire a torpedo from each tube and, having been informed of the enemy's course and speed, should make good shots. In this figure ( ) represents the original position, ● positions at the time the torpedoes are fired, ● positions when the destroyers are again protected; o o positions of Nos. 1 and 2 of the column when torpedoes should hit.

It is evident that, with destroyers to protect, our course should never be more than four points from the bearing of the enemy, for with other courses insufficient protection will be given.

Floating Mines.—Floating mines seem to have played an important part in the destruction of ships during the Russian-Japanese war and although it is quite true that peaceful merchantmen suffered most this does not detract from a recognition of their efficiency. Their value in an engagement is slight unless by manœuvres the enemy can be drawn over an area previously strewn with mines. It is evident that the principal use of floating mines will be to keep the enemy from following directly astern in pursuit, and the principal disadvantages, the small chance of damage to an enemy and the chance of being forced over the mine field by a superior force. The position of the mines must be well plotted and accurate allowance made for drift in order to make sure the mine field is not recrossed.

From accounts of the battle of August 10, 1904, we learn that the Russians suspected the Japanese of placing floating mines in their path. These mines were supposed to have been placed from torpedo-boats. This has not, to my knowledge at least, been confirmed by the Japanese, but, nevertheless, the Russians avoided that part of the ocean showing great respect for the efficiency of the floating mine.

DISCUSSION.

Professor PHILIP R. ALGER, U. S. Navy.—I am glad to see that Lieutenant Pye has pricked the bubble, "concentration." The human mind is prone to be hypnotized by a phrase, and the absurd idea that concentrating the fire of several, or all, of one's ships upon a single ship of the enemy is the same kind of concentration which was practiced by the great captains of all ages, and which we recognize as one of the first principles of tactics, has found too ready acceptance in our navy. Above all, this fallacy has been spread abroad by the practice of the naval war game in accordance with our war college rules. Under those rules there is advantage in this spurious concentration, and many have not perceived that this advantage exists only *on paper* and that the real result *on the field of battle* would be disaster.

Lieut.-Commander A. B. HOFF, U. S. Navy.—Lieutenant Pye has certainly brought out his points most fully, and his hints are valuable and interesting in this most absorbing of studies.

It is an entire exposition of the battle maxims generally accepted, and which were clearly impressed on the minds of all present at the winter maneuvers of 1907.

These maxims I take to be:

1. Avoid changes in speed and direction.
2. All movements to be simultaneous.
3. Line for approach.
4. Column for action.
5. Enemy's rear ship four points on bow for chase.
6. Leaders abeam for action.

The diagrams are splendidly illustrative of the text, although the ranges seem short for modern warfare. Also eight ships seems a smaller number than will usually form the "main line" of a first-class power.

These last two conditions modify considerably some of the evolutions described. This is principally to be noted in: (1) point of greatest "fire volume," Plates II, III, and IV; (2) time of successive maneuvers; (3) counter circling, Plate IX.

Again I note that many of the maneuvers described hardly appear to be tactical (*i. e.*, battle) evolutions, but more in the nature of "admiral's drill." In a way, it seems hard to imagine "B" squadron (Plate IX) allowing itself to be got into such a hole without being pretty well cut up before it got to its second position.

(This is very similar to the beginning of Tsushima.)

On page 4 the essayist says: "Maximum gun fire, if target can be kept on proper bearing." ". . . . is one of the *primary* aims of naval tactics." I should be rather led to say that it is *the* primary aim of tactics. certainly for the main line of battle. Other considerations, of course, will govern the use of destroyers, mine layers, fast armored divisions, and scouts, but maximum gun fire efficiency is what governs the main action.

The chief point, I believe, to be noted in the essay, and also in all our war games, is that "volume of fire" is not "efficiency" of fire.

Now the fire of two ships firing on one is not twice as efficient as the fire of one on one. This is plainly so because the fire cannot be controlled as well when the splash of the other ship interferes with spotting. Yet most tactics and all our war games are based on the idea that it doubles the damage.

Take two squadrons:

"A" admiral has his three best *gunnery* ships in the lead, and say his three next best as tail-enders. His second in comand is in the last ship, so as to lead if he has to go about.

"A" fires each at his opposite in line. Each ship's fire can thus be controlled to the maximum capable of its skill, and every "B" ship is under fire. "B" on the contrary carries his "volume of fire" idea into his dispositions and places his *heaviest* ships in lead and rear, and concentrates as is usual in war games.

This leaves half of "A's" squadron not under fire at all and hence up to their maximum effort, while "A's" other four ships are not receiving a double damage on account of "B" not being able to control his fire up to his maximum, due to: (1) interfering splashes, and (2) to being under fire from "A."

Moreover, if there was an "about," "B" has no flag leading.

The above is the gist of my argument. If two men are fighting two men, and both on one side jump on one of the other, the unengaged man has a capital chance to get in one on the point of the jaw with the other two in succession, as no one is paying any attention to him during the mix-up. It, therefore, seems a fairer scheme to base our war games and battle tactics on "efficiency" rather than "volume" of fire.

Counter circling would not then be such a favorite in the initial stages of a war game.

Experiment should show something of this—two ships firing at one target.

The essayist's summary of weather vantage and concentration are most complete. And the automatic torpedo distance card is invaluable.

Under "Concentration" (p. 32, par. 3-end), the essayist hits the nail squarely when he says: "If each ship is firing at the best target, it is the logical distribution of fire."

The admiral's fire tactics will probably be automatic, as will also be the captain's general orders to the fire-control officer. With a serviceable conning tower, skeletonized masts, absence of top hamper, and freedom from inflammable material, the communication between captain and fire control would be so improved that the question of targets and fire direction would probably be simplified to the point of practicability.

It is to be hoped for the efficiency of the fleet that these conditions will soon be obtained in both our old and new ships.

Fire efficiency is, therefore, a question of tactics and top hamper.

There yet remains the subject of destroyers, scouts, fast armored divisions, and mine layers. The latter is a new departure, and a necessary one, for it is scarcely to be supposed that battleships in action are going to get up and drop mines overboard.

The service should be greatly obliged and indebted to Lieutenant Pye for this admirable paper. I believe it is the first one that has made a serious beginning into the subject of handling destroyers in battle. There is, however, the indented line yet to consider.

Captain B. A. Fiske, U. S. Navy.—Mr. Pye is much to be congratulated on his clear and painstaking discussion of one of the most obscure subjects in the world—Naval Tactics.

But while one must admire the dexterity of the essayist, in reducing to geometrical form the almost countless unknown quantities of the problem, a few criticisms of a practical kind seem to demand consideration.

1. Near the bottom of page 4 occurs the statement: "Column is the best formation during the action, but the poorest for approach or retreat."

Granting the truth of the first clause, as we all do, is not the second clause a tremendous generalization, and one without any precedent to support it? Does not the best formation for approach depend on the bearing and distance of the enemy, and also on the direction in which he is going and his speed?

2. On page 6, near the middle, the essayist states: "Line is a good formation for approach or retreat. The bearing of the line should be, as nearly as possible, perpendicular to the direction of the enemy."

Remembering the criticism just attempted, one may suggest further, in criticism, that the bearing of the line should not be perpendicular to the *direction* of the enemy, unless the bearing of the enemy does not change; unless, that is, the enemy is coming straight. If, however, the enemy were steering, say in column, in some other direction (perpendicular to the line joining the fleets, to take an extreme case), a fleet in a line perpendicular to the direction of the enemy would certainly not approach in either the quickest or the safest way; and, furthermore, the direction would be constantly changing. Besides, line is a difficult formation to maintain, even in good weather, with plenty of help on the bridge, a compass under the eye of the officer of the deck, and no distraction. But let us remember that modern ordnance is much more deadly than it used to be, and that men are just as vulnerable as ever; so that the men directing the ships must be under cover of some kind, and, therefore, handicapped in the way of seeing. This being the case, is it probable that a line could be preserved so good that the ships could be swung into column without confusion and delay? Now, confusion and delay would be two undesirable things at the beginning of a battle.

Again, if line be a difficult formation to maintain in approach, what shall be said of it as a formation in which to retreat, when the retreating ships will be much battered and more or less disabled?

3. On page 8, the essayist states: "Line of bearing is a good formation for approach or retreat, the line of bearing being perpendicular to the direction of the enemy." In one way line of bearing is better than simple line; it is not confined to one compass course, but permits the course to be changed very quickly, *provided, of course, that signals can be made and understood.*

But, except for this, line of bearing seems a much worse formation than line, for either approach or retreat, simply because it is much more difficult to maintain. We all know that this is true, even under the best conditions. But would it be even possible to maintain it, unless the enemy were so far away, and approaching so slowly that the ships could be directed from the bridges? This directing might be done; but it would seem a little risky to be within sight of the enemy, and approaching him, and not have everyone at his battle station. Besides, is the possible advantage to be gained likely to be great enough to warrant a departure from those simple formations that nearly every officer now seems to think the best?

4. On pages 10, 12, and 14, the essayist discusses the relative advantages of the rectangular method, the direct method and the special methods, largely with reference to interference with gun fire. Imagine making maneuvers *under gun fire* by a direct or a special method! It seems inconceivable that any commander-in-chief ever should attempt it; certainly no commander-in-chief ever has attempted it.

5. On page 16, the essayist states, speaking of the "laws governing the maneuvers of two squadrons *within fighting range*": "The most advantageous position is in line of bearing," etc. Let anyone who has been officer of the deck while the fleet was steaming on a line of bearing, with the compass under his eye and a stadimeter in his hand, standing on a high bridge, with a clear view, and a general condition of tranquility—let him remember how difficult he found his job, and then let him imagine himself doing this from the conning tower, without any compass, and with a frightful noise all around him, his difficulty of seeing through the slits in the conning tower increased by the gun smoke and coal smoke over everything!

6. On page 19, the essayist shows a fleet in line of bearing and then changing from line of bearing to column *under gun fire*. The same objections to line of bearing, under gun fire, may be repeated. And let it be borne in mind that, if a maneuver is attempted in battle that cannot be well carried out, *confusion and loss of gun fire cannot be prevented.*

7. On page 20, last paragraph, the essayist states: "Approaching in column is at variance with our first law of position." Yet this is exactly what was done at Tsushima, our solitary model of a modern fleet battle!

8. In the "Plan of Imaginary Battle," no good reason appears for B changing from column to line of bearing and then back to column. It would have been just as effective, and much easier, to have continued in column, and changed to SW, when ready, if indeed that change were desirable. And a maneuver by special method, such as shown at the bottom of the diagram, *carried out under fire*, would have been so highly dangerous, so out of proportion to the hypothetical advantage hoped for (which was not, in fact, attained), that it seems incredible that any commander-in-chief would ever attempt it. Certainly no commander-in-chief ever has attempted it.

9. At the conclusion of the imaginary battle, the beaten B "assumes a line of bearing!" How could a fleet, subjected long enough, and cruelly

enough, to the fire of modern ordnance to be beaten in a battle, how could it possibly steam off so geometrically?

10. The writer takes much pleasure in agreeing with the essayist's views on concentration, which Professor Alger and he have endeavored to expound in three numbers of the INSTITUTE.

11. On page 33, about the middle, the essayist speaks of "The inefficient handling of the Russian squadron, and still more inefficient handling of their guns," etc. Not in any spirit of criticism, but as a matter of professional interest, it may be pointed out here that one depends on the other. Particularly does ineffective ship and fleet handling result from inferior gunnery; for the reason that the "hail of projectiles" received in consequence affects the nerves and judgment of the personnel and the condition of the material. The fleet that is receiving the less abuse can naturally maneuver the better. This explains, in a measure, the comparative precision of the Japanese maneuvers at Tsushima, compared with those of the Russians.

This does not mean that the Japanese used any complicated maneuvers; we know they did not.

12. On pages 34, 35 and 36, the essayist shows some torpedo range cards. These are extremely ingenious, and show the signs of careful thought. But are they not constructed on the fundamental misconception that the use of a torpedo, on board a battleship, is to be fired at another *ship, at the long ranges shown?* This assumes an accuracy for the torpedo and its method of firing far beyond what I understand to be claimed for them. Is not the use of a battleship torpedo, to be fired at a *distant fleet* or a *near ship?*

13. On page 37, the essayist shows two squadrons carrying on gun fire and torpedo fire, while steaming on a line of bearing. This seems impracticable for reasons already given.

14. On page 39 are shown certain arrangements used in the German navy, whereby torpedo destroyers can be used to help a fleet. Doubtless, this might be done in good weather near shore. But this suggests the question, "Why do not the arguments in favor of a few big ships, as compared with many small ships—why do they not apply to torpedo vessels?" What is the use in having a dozen half-seaworthy little torpedo boats, when the same money would give us, say, two big torpedo ships, that would be faster than any battleship, perfectly seaworthy, and practically invulnerable to gun fire?

Commander A. P. NIBLACK, U. S. Navy.—There is no officer in the navy better qualified than Lieutenant Pye to discuss theoretical conditions as to naval tactics, and until there come from the fleet the actual data with regard to range and position movements we are not going to get away from the game-board because the data given in the essay must be game-board data since they are not known to exist practically—at least for publication. This essay frankly supplements my essay on "The Elements of Fleet Tactics," published in the NAVAL INSTITUTE PROCEEDINGS, which essay, under the limitations as to 50 pages, could not embrace anything

more than the elementary principles, and I feel that I would be lacking in courtesy if I did not express my appreciation of the "step further" the essay has taken.

His treatment of concentration is excellent and his approval of the natural target or the common-sense target, as seen by the eye of the fire-control officer, is in line with the best thought of the service. It is a curious fact that the game-board rules permit concentration on one or more ships with cumulative effect, while the rules used in our fleet maneuvers make concentration of three ships on one actually count less than that of two ships on one, on the ground of interference in the spotting. As a matter of fact it seems to be pretty well agreed that, in action, every fire-control officer will know best which ship to fire at, but will fire at a particular ship if ordered.

Without wishing to appear to detract from Lieutenant Pye's treatment of torpedo fire, which is excellent, he is probably unfamiliar with the diagrams of Lieut-Commander G. W. Logan, U. S. N., which solve at a glance every question of torpedo range.

I am very glad that an essay on naval tactics has gotten first prize in the Naval Institute. The War College does not give its tactical findings to the officers who are not fortunate enough to attend the course, and the rest of us must work out our own salvation. This essay is a lucid and clear exposition of the current thought of the student body of younger officers in the navy. What the older officers are thinking on these questions is a matter of such profound importance, in case of war, that it seems, with my limited view, that some tangible, practicable results should be forthcoming soon, or else that we be contented with the theory.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

FIRST HONORABLE MENTION.

THE MONEY FOR THE NAVY.

By PAY-INSPECTOR JOHN A. MUDD, U. S. Navy.

Motto: "By value received."

I. SIMPLIFICATION AND CONSOLIDATION OF NAVAL APPROPRIATIONS WILL PROMOTE EFFICIENCY AND REDUCE THE COSTS.

The resources of the navy, as a business institution, are the citizens of the country, as partners, and that portion of the public wealth that is set aside for the maintenance of sea power. As the people are not active partners, the sole practical resource is the money voted by their representatives in Congress. This comes mainly in the form of an annual appropriation.

The officers of the navy, or other parts of the permanent personnel are not a resource by themselves; they are but a product of the great resource—MONEY. Should that fount fail, the personnel would vanish, in time of peace.

The annual appropriations are based on estimates submitted by the Navy Department each year to Congress. These estimates are prepared for the Secretary of the Navy by the various bureaus of the Department. They seldom reach Congress in the shape they leave the hands of the bureau chiefs; the naval committees seldom honor any part of them at its face value; and the appropriation bill, as passed, is the result of arduous labor by a few committee members, who never take final action until the Secretary and the bureau chiefs have been put through the third degree at the Capitol. After the bill is passed, the navy is credited, on the books of the Treasury Department, with its amount, under the various appropriations, distributed among eight bureaus, and the funds then become subject, practically, to the control of the bureau

chiefs. As money appropriated for one bureau cannot be used for the purposes of another, the Secretary rarely exerts any power in the business of expenditures under bureau appropriations. Beyond his attention to those that do not come under any particular bureau, and general instructions he may issue from time to time concerning expenditures under *all* appropriations, he takes no intimate part in the spending of the money for routine matters.

Values are kept track of in the navy by means of ledger accounts, which, for the sake of brevity, are titled from the capital letters of the alphabet. When supplies are bought and placed in store on shore, their value is made a charge against Title X, while those carried in the storerooms afloat stand charged to Title Y. Money expended for building ships, or supplies drawn from store for that purpose are charged to Title A. All expenditures of value, either money for wages or material from store, on account of repairing ships is charged to Title D, and that on account of repairing articles of equipage of ships in commission, to Title P. To Title C goes the expenditure of value in maintaining the fleet in commission; that is, the running expenses of the ships, which include the pay of everybody afloat, the value of material consumed, navigation expenses, etc. Title E receives disbursement of money or store material for increasing the real estate and chattels of shore stations, and carries the total value of such asset indefinitely. To Title F go machinery and machine tools for shore stations, the same as real estate and chattels to E. Title B carries the equipage of ships in commission, that is, chattels afloat. In Title N lodge expenditures for experiments and tests conducted at shore stations, and the cost of building models of ships. Title G shows value expended for maintenance of the shore stations, being something like C for ships in commission. Title Z is the manufacture account, carrying value of raw material being converted in the navy yard shops into articles of ship's equipage, or of old articles of equipage being repaired, to be turned back afterwards into store; and to this account are charged the value of the raw material and the cost of the labor used, and to it is credited the value of the completed articles turned into store. There are other accounts, but they will not be named here, being of no particular interest in connection with this paper.

Once a year these ledger accounts are dressed up for Sunday, and come forth in the form of interesting and instructive tables

or statements issued by the paymaster general with his annual report to the Secretary of the Navy.

It is common knowledge that the Secretary, when he directed the bureaus to prepare the estimates for the fiscal year 1908, called for a statement of the approximate amounts expended during the previous year under the principal *sub-heads* of the annual appropriations. The Bureau of Supplies and Accounts acknowledged this could not be made, and had no trouble explaining why, through no fault of its own, it could not give the information. Expenditures had never been recorded according to sub-heads of appropriations; purchases of supplies for stock had been made under no specific portion of the appropriation involved; and the method of yard manufacture and the common use of stock after a certain period prevented, and the wording of the specifications of the appropriation act, in many cases, positively prevented any segregation, approximating the truth, of expenditures according to sub-heads of appropriations. Yet the request of the Secretary would seem a proper one to a business man. That is, if an appropriation should read "Dreams, 1906," and under it appeared the sub-heads "Fiddlesticks" and "Elephants," it would seem that it ought to be known how much of the appropriation was spent for music and how much for animals. But a run through the appropriation act will show how futile it would be to attempt to charge expenditures to the sub-heads of appropriations as they stand, even if there is nothing else to prevent it.

CRITICISM OF THE STYLE AND TEXT OF THE PRESENT NAVAL APPROPRIATIONS.

The act making appropriation for the support of the navy for the fiscal year 1908, that is, from July 1, 1907, to June 30, 1908, covers one hundred distinct appropriations, not counting those for the increase in ships. Under these main appropriations there are, in the aggregate, nearly five hundred sub-appropriations or heads, that is, "semi-colons," in the specifications describing the various kinds of expenditure permitted under the main appropriations. With some of the appropriations the sub-heads have definite amounts placed after them, which amounts, in the aggregate, make up the sum total of the appropriation. Others carry no such division of the main sum, the allotment for the purposes of each sub-head being left properly to the discretion of the Secretary of

the Navy or the bureau chiefs. There seems to be no rule about this matter, the form apparently depending on the whim of the originator, the legislative censor, or the office boy.

Only fifty-eight of the appropriations are regular ones for meeting the annual expenses, and which lapse with the expiration of the year covered. The remainder are for specific purposes, and are available until the purpose for which made has been accomplished, or officially abandoned. The regular annual appropriations are the ones that are entitled to the interest of all who aim at sound organization and the abolition of costly labor that brings no return to the government.

In dissecting some of the specifications strange jumbles are exposed. For instance, in the case of the appropriation Equipment of Vessels, which reads, in part, " For hemp, wire, iron, and other materials for the manufacture of cordage, anchors, cables, galleys, and chains; stationery for chaplains, and for commanding and navigating officers of ships, equipment officers ashore and afloat, and for the use of courts-martial on board ship; . . . . and for the purchase of all other articles of equipment at home and abroad, ... libraries for ships of war; naval signals and apparatus . . . . and running lights; compass fittings; logs and other appliances for measuring the ship's way, and leads and other appliances for sounding; lanterns and lamps and other appendages for general use on board ship for illuminating purposes, and oil and candles used in connection therewith; . . . . installing, repairing, and maintaining . . . . all electrical appliances of whatsoever nature on board naval vessels . . . . , three million two hundred and fifty thousand dollars." A queer mixture this, made up, it is supposed, from the accumulation of many years, without corresponding weeding out. It is carefully stated that this appropriation covers the oil used in the lamps on board ship, but there is no specific mention of the oil used in the electrical department, under the cognizance of the Bureau of Equipment, which takes a much larger amount of the appropriation than the lamp oil. In this day of electric lights, what a small part of the three and a quarter millions will be spent for illuminating oil; and yet it is one of the things specifically mentioned, where only a few of thousands of items covered are so mentioned. It will be noticed that about the middle of the specifications comes the clause " and for the purchase of all other articles of equipment at home and

abroad" (why "at home and abroad"?); and yet after these all embracing words comes another lot of specifically noted "articles of equipment." What is the use? Further, why not have simply the one word "stationery" instead of going to the length of stating that it is for the chaplain, the commanding officer, the navigator, and so on. Rest assured a bureau is not going to spend its money for anyone it is not obliged to provide for.

A "semi-colon" of the appropriation Contingent, Bureau of Equipment reads: "ferriage, ice, and emergencies arising under cognizance of the Bureau of Equipment unforeseen and impossible to classify." Why is ice yoked with emergencies? Stranger yet is the classification of the emergencies. They are stated to be of the kind that cannot be foreseen. Webster's dictionary defines emergency as being an unforeseen occurrence.

Under the Bureau of Yards and Docks there is an appropriation of $950,000, styled Maintenance of Yards and Docks, and with specifications about the maintenance and repair of oxen, carts, timber-wheels, etc., "incidental labor at navy yards" (whatever that means), packing boxes (Yards and Docks uses about one of these a year), and postage on "other mailable matter." It will be noticed that this last clause prevents postage being paid on freight. Following this carefully specified appropriation is one entitled Repairs and Preservation at Navy Yards, of one half million dollars, and without even one little specification. And the navy can repair a "timber-wheel" or preserve an ox just as legally under this unspecified appropriation as under the one that permits the Bureau of Yards and Docks to buy packing boxes.

Under the Bureau of Navigation, an appropriation styled Naval Training Station, Rhode Island, covers "Labor and material; buildings and wharves; dredging channels; general care, repairs, and improvements of grounds, buildings, and wharves; packing boxes," etc. Further on, under another appropriation, "Naval Training Station, Rhode Island, *Buildings*," it is specified: "Improving and grading grounds and roads; rebuilding old timber wharf and improving water front; dredging channel and basin"; etc. Here are two specified appropriations that may be used for the same purposes.

The appropriation Contingent, Bureau of Supplies and Accounts, has this semi-colon: "expenses of the naval clothing fac-

tory and machinery for the same, postage, telegrams, telephones, tolls, ferriages, yeoman's stores, safes, newspapers, ice." Has anything been left out? Yes, packing boxes, and in the case of the bureau that uses all of them. At the clothing factory the clothes for thirty thousand enlisted men are made, and yet the money for its maintenance is obtained under a clause of a contingent appropriation, which particular clause also provides for the ice, newspapers, and "tolls" for the pay department of the navy. (Incidentally, the members of the pay department and other departments pay for all the newspapers they read.)

An interesting appropriation, in the style of its specifications, is that of Construction and Repair of Vessels. It reads: "For preservation and completion of vessels on the stocks and in ordinary; purchase of material and stores of all kinds; steam steerers, pneumatic steerers, steam capstans, steam windlasses, and all other auxiliaries; labor in navy yards and on foreign stations; purchase of machinery and tools for use in shops; carrying on work of experimental model tank; designing naval vessels; construction and repair of yard craft, lighters, and barges; wear, tear, and repair of vessels afloat; general care, increase, and protection of the navy in the line of construction and repair; incidental expenses for vessels and navy yards, inspectors' offices," etc., "seven million nine hundred thousand dollars." Keeping in mind the fact that the Secretary of the Navy and Congress would like to have annual statements of the amounts expended under the various sub-heads of appropriations, it is plain that there are hundreds of different kinds of expenditure items in construction and ship repairs work that could be charged to any one of several of the sub-heads of this appropriation. More than one of these sub-heads is all-embracing, rendering the others superfluous. For instance, "general care, increase, and protection of the navy in the line of construction and repair." And, by the way, why the word "increase" here? Way back, at the end of the long act, are appropriations giving many millions for the specific purpose of increasing the size of the navy, and one of the items covered by them is "hulls and outfits of vessels." The first sub-head in this Construction and Repair appropriation is also a puzzler—"For preservation and completion of vessels on the stocks . . . . ." What vessels not covered by the special appropriations for increasing the navy are

on the stocks, or, for many years, have been on the stocks, awaiting completion? The clause about *steam* capstans, *steam* steerers, *steam* wildcats, and pneumatic steerers deserves attention with the other strange things. The insistence on the "steam" is understandable. No doubt it was inserted many years ago to keep the engineers from installing such articles. Steam, after all, is only extremely heated water. But while the "trade" of ship machinery design and control might not think of laying claim to all the water, it would seem natural to have it object to the interference of others in things connected with extremely heated water—steam. Therefore, for the ship designers and builders to gain exclusive control over the steam things around the decks, it was necessary to make it LAW. Not so with the pneumatic steerers. Air, even extremely heated air, might be said to be commoner than water. It is quite certain that no "trade" (see page 63) wants to lay public claim to all the extremely heated air used in the service, and it is simply absurd to think of any claiming all the air. The writer knows little in regard to pneumatics and not a thing in regard to thermopneumatics, but he believes that only cool air is used in the pneumatic steerers. So why bother everybody, down to the printer, each year, with these extra words?

Of the appropriation Steam Machinery there cannot be much criticism, as appropriations go, except that, contrary to the form of the other principal regular appropriations, it is divided into three different lots of semi-colons, each lot carrying a specific amount of money, and the appropriation winding up with a statement of the total amount, being the aggregate of the three sub-amounts. In accounting, no attention is paid, either by the Treasury or the Navy Department, to these sub-divisions of the total amount of the appropriation, which practice does not fit in with the strictness along some other lines.

The clauses in the appropriations of the Bureau of Ordnance overlap to an extent, and there is room there also for mending.

Under the Bureaus of Equipment, Construction and Repair, Steam Engineering, Ordnance, Yards and Docks, and Supplies and Accounts are "civil establishment" appropriations, in the specifications of which are named each clerical position covered, the yard to which it pertains, and the salary it carries. Under the Bureau of Medicine and Surgery, the only mention of such expen-

ditures occurs in the appropriation styled Medical Department, which reads as follows: "For surgeons' necessaries for vessels in commission, navy yards, naval stations, Marine Corps, and for the civil establishment at the several naval hospitals, navy yards, naval laboratory, museum of hygiene and department of instruction, and Naval Academy, two hundred and fifty thousand dollars." This is an exact quotation, but there was no intention to have the appropriation cover surgeons' necessaries for the civil establishment of the navy yards, etc. What is meant is to provide for the pay of the civil establishment. It will be noticed that there are no particular positions or amounts of salaries mentioned, as in the case of the other bureaus. Which is the right way? It is hoped that the final answer will be that of the Bureau of Medicine and Surgery. As a short example of the other way: Under the appropriations of the Bureau of Navigation there is nearly a whole page of printed matter used to specify for what the sum for the civil force of the Naval Home alone is to be used. It is carefully and accurately set forth that there may be employed, during the fiscal year 1908, "three laborers at $360 each," and another "three laborers at $300 each," "four scrubbers at $168 each," "one kitchen maid at $240," "eight waitresses at $168 each," "five laundresses at $168 each," and so on, through the domestic and anti-domestic outfit of the Home.

Something akin to the care taken to specify the "packing box," which item appears in about a half dozen appropriations, is the provision for paying "tolls." The word occurs in five different appropriations. The only tolls the writer ever heard of in connection with the naval establishment are those for putting ships through the Suez Canal and those for passing the commandant's carriage over the Kittery bridge in Maine.

This particular criticism could be carried on to greater length, but it is thought what has been stated will suffice for the purpose. Now, is it worth the expense keeping an account of expenditures under such sub-heads as quoted? Likely not. Nor will it be worth while to have a system based on any other collection of such specific sub-heads. It will be well to be rid entirely of the sub-head business, so far as it is connected with the central system of exact accounts, and charge finally only to appropriation heads covering specified amounts, as will now be shown.

SIMPLIFIED AND CONSOLIDATED APPROPRIATIONS.

It is believed by the writer that the whole principle of the construction of the appropriation acts is wrong. Instead of the hodgepodge that has just been partly exposed, the appropriations should be specified along the general lines of what must be done to maintain the navy as a fighting business institution; and this method would not call for the special mention of *steam* capstans, timber-wheels, etc., in fact, would not call for the special mention of any article of supplies or material, or of any group of such articles. A bill could be devised that would not have one tenth the words of the present act, so far as the regular bureau appropriations are concerned, and that would cover the same ground. It should be drawn up under the general heads of all navy effort, leaving to the responsible Department officials the decision as to what was necessary to be bought or hired in order to effect the results aimed at in maintaining a navy. Then an instructive and valuable set of accounts of the expenditures under these general heads could be kept; and that should be all to be desired for the "final books of entry." In this new style of appropriation bill the writer would not have the money divided by bureaus at all, although the bureaus would continue to make their annual estimates.

The following is presented as a suggestion for an appropriation bill, according to the ideas set forth in this paper:

AN ACT, ETC.

Be it enacted . . . . , That the following sums be, and they are hereby appropriated for the naval service of the Government, for the year ending . . . . , and for other purposes.

For the Fleet.

For the necessary services, labor, and material in the maintenance of the fleet, as follows:

New construction—hulls, including armor.....$———
" " machinery, of all kinds..... ———
" " equipment, including armament..... ———
Repairs—covering ordinary wear and tear..... ———
" " casualities ..... ———
" " additions, changes, and improvements..... ———
Care and preservation (not repairs), when out of commission.... ———
Equipage and supplies..... ———
Incidental running expenses, not including those directly involving equipage, supplies, and personnel; such as pilotage and towage, port and dock charges, canal tolls, quarantine expenses, wharfage, ash lighters, etc..... ———

Inspections, maneuvers, drills, target practice, etc.—not to include the value of equipage and supplies ordinarily carried on board ship .....$——
Maintenance of naval auxiliaries—not covered by other heads of appropriations ..... ——

NOTE.—Under "fleet" shall be included all vessels of the navy not classed as "yard craft."

For the Shore Plant.

New construction of buildings (specified).....$——
Repairs, preservation, care, and rent of buildings, offices, etc.... ——
New work on grounds, roads, walks, sewers, etc. (specified).... ——
Repairs, preservation, and care of grounds, roads, walks, gardens, sewers, etc. ..... ——
New work on water front, wharves, piers, dry docks, approaches, ferry landings, etc. (specified)..... ——
Repairs, preservation, and care of water front, wharves, piers, dry docks, approaches, ferry landings, etc., and rent of wharfage, etc. ..... ——
New work (not specified under other heads of appropriations) connected with power, heat, and light (specified)..... ——
Repairs, preservation, care, and other running expenses of power, heat, and light apparatus..... ——
New permanent interior fittings, including instruments, machinery, and boilers (specified)..... ——
Repairs, preservation, care, and other running expenses of permanent interior fittings, including cost of shop tools..... ——
Additions and repairs to furniture, office fittings, and permanent clerical necessaries ..... ——
Office expenses, including pay of employees, cost of stationery, etc. ——
Additions to outside-of-building appliances, including floating appliances (specified) ..... ——
Repairs, preservation, care, and other running expenses of outside-of-building appliances ..... ——
New construction of yard craft (specified)..... ——
Repairs, preservation, care, and other running expenses of yard craft ..... ——
Inspection, care, moving, inventory, packing, issue, shipment (not including freight and express charges), and other such expenses connected with handling unused material and supplies ——
Water taxes and ice, and outside gas and electric light charges.. ——

For the Permanent Personnel.

Pay of those performing duty .....$——
Pay of those not performing duty, including all allowances to those on the retired list and the support of beneficiaries at the Naval Home ..... ——
Actual subsistence and commuted rations..... ——

Allowances and payments for quarters, light, and heat.....$———
Traveling expenses, including mileage..... ———
Instruction, including expenses of Navy Department library, and cost of technical and other books and periodicals of reference, models, plans, etc..... ———
Prizes, rewards of merit, etc..... ———
Commissions, continuous service certificates, etc..... ———
Expenses of courts of inquiry, courts-martial, stragglers, deserters, prisoners, and prisons, and legal expenses relating to the personnel ..... ———
Expenses of examining boards and of recruiting, including first enlistment outfits ..... ———
Expenses attendant upon the maintenance of health and other sanitary conditions, and the disposal of the dead and their effects—not covered by other heads of appropriations..... ———

For Incidentals.

Net loss by exchange, interest on daily balances, and cost of transportation of funds..... ———
Advertising ..... ———
Printing, photographing, engraving, lithographing, etc..... ———
Telegraph and telephone charges, foreign postage, and car, ferry, bridge, etc., charges..... ———
Freight, express, and cartage charges..... ———
Washing ..... ———
Suits at law..... ———
Emergency expenses and incidental expenses not specified under any other head of appropriation. Each case of expenditure arising hereunder to be reported specifically to Congress with the estimates following the close of the fiscal year..... ———

Glance over the generous pamphlet containing the digest of the naval appropriations for the fiscal year 1908 and compare what you see with what is offered here. Those who take a particular interest in the matter of this paper should read this part of it with the digest by their side, for ready reference. A copy may be obtained from any pay officer or yard department office.

There is not a clause, a semi-colon, in the bill for 1908 that cannot be placed under one of the heads in the new form of bill submitted. It is not claimed that the suggestion is perfect, and it is not set forth as a finality, but is put here to show clearly what is in the writer's mind in advocating such a radical change from the present form. If the Department should favor this new style of bill, estimates along its lines could be submitted next year with the estimates in the usual form, and Congress left to choose.

It would have been more consistent to have melded the maintenance of the personnel and the expenses for "incidentals" with that of the fleet and the shore plant; but the writer has compromised with theory, for the sake of safety, at least in the case of the personnel. The permanent personnel is the whole of the vital organs of the body called the naval establishment. Were the spark of life taken from those organs, that is, MONEY, in time of peace, the sturdy muscles of the limbs that deal the blows, the arteries of transmission, etc. would become dead tissue, starting on quick decay. So it will not do to risk the pay of the permanent personnel with the other allotments by Congress. Bad administration *might* exhaust for material what should have been retained for salaries, and then a lot of worthy gunner's mates, admirals, jacks-o'-the-dust, midshipmen, etc. would be left without the spark of life in their wallets. This extreme precaution is not necessary in the case of any other kind of expenditure under the naval establishment. The "incidentals" of the proposed bill cover services that are common to both the fleet and the shore plant, and it will readily be seen why they are placed by themselves.

It is not the intention to cover the Naval Academy with this new draft of a bill. For years there has been an earnest effort made to have the Academy appropriations separated from those of the rest of the naval establishment. It is to be hoped that the advocates of this measure will finally succeed. There is no space here to go into the reasons for the change. Suffice it is to state that they are good ones. The money for West Point's maintenance is appropriated in a bill separate from the regular army bill.

The proposed bill would fit in well with the present system of ledger accounts under alphabetical titles, and render the bookkeeping simpler, although this is only one of its many good features. And in passing here, the writer will take the liberty to step aside just a moment to put on record a change or two he would like to see made in these ledger accounts. Title Y, supplies afloat, should be abolished, and all "supplies" expended to Title C, cost of commission, at the time of issue to the ships. It will be a simple matter to give credit to C for unused supplies afterwards turned into store from the ships. Title B, equipage afloat, should not be treated as a stock account, as at present, but should be transformed into an account to carry the value of sea chattels in exactly the same manner as shore chattels are carried under Title

E. These two changes would save an immense amount of sea bookkeeping and returning, and if made, the writer feels certain there would be heard, from afar, welling up into the skies, a song of thanksgiving from the fleet. Another useful change in the ledger accounts would be the amalgamation of Title E, shore property and chattels, and Title F, shore machinery. Experience has shown that there is no reason for separating these two accounts.

ESTIMATING FOR THE APPROPRIATIONS.

With the proposed appropriation bill a fact, the gathering of the estimates each year should be systematized along the lines of concrete exactness. There should be numbered estimate "groups," and within some one, but not some two of these groups would come every person, thing, or agreement that takes navy appropriation money to keep it going in the way required for maintaining the establishment. There could be several circles of these groups around the Secretary of the Navy, who submits the estimates to Congress. The inner circle should consist only of the various bureaus, designated not by numbers but by their present names. The circle outside this inner circle should be composed of the bureaus' main groups, numbered in a separate series for each bureau, with the particular bureaus' abbreviation to identify the series, as, C & R 7, Eq 5, etc. In these numbers should appear none with a zero in it, such numbers being skipped. Around the second circle should be a circle of the main groups' groups, that would report to the main groups direct and not to the bureaus. The groups of the third circle should bear numbers from a series belonging to the main bureau group of which they are a branch, this number being written after the main group number, but separated from it by a zero, as, C & R 7012. An estimate card bearing that number would mean that it came from the 12th sub-group of the 7th main group of the Bureau of Construction and Repair. The sub-numbers should have no zeros in them, for beyond their circle there may be others, extending as far as necessary for practical purposes. So, if an estimate card appeared with the designation "Ord 20170305 03," it would be known that it came from the sixth estimate circle, that it related to the Bureau of Ordnance's expenses, and that its amount would be included in the amount carried by card "Ord 20170305," and so on down.

Some one person would be responsible for the estimates from each group or sub-group, and that responsibility would be to the father group of the circle just within, and not to the grandfather group two circles off. The estimate cards should show the amount under each appropriation head, spent for the maintenance of the group during the last completed fiscal year, the amount estimated for the current one, and the amount required for the next one, all of which need not be to a bookkeeper's exactness, but should be within arm's reach of the truth On the back of the card should be written any explanation necessary. Each card should be signed by the responsible person, and then handed down by him to the parent group in the nearest inner circle.

Any unit of an organization should be able to state definitely what is accomplished by it. In business, one must be able to state, along with what he "wants" to do, what it is likely to cost to do it. No man is fit to be an active worker at any kind of a job, where the interests of others are involved, unless he has some idea of the cost. The man who says "I know exactly what to do in this case but I have no idea of what the cost will be" is about as desirable a citizen in this age as he who loves to say that he knows exactly what he wants to say but that he cannot put it into words.

After the bureaus had submitted their estimates to the Secretary, he could bring them together under the proper appropriation headings, without regard to bureau, and compare them with the books of exact accounts, in charge of the Bureau of Supplies and Accounts, before submitting them to Congress. The appropriation act passed, the Secretary could allot money to the various bureaus, from the different divisions of the bill, along the lines of their estimates; but he would not have to allot except in the way he chose, and would not be obliged to allot at one time for the entire year. So, if he saw one worthy bureau fainting by the wayside towards the month of June for the want of sustenance, while a proud neighbor, fat on generous allotment, went haughtily by, he could do some readjusting.

The appropriations being made without regard to any particular bureau will work reform in more than one direction. The writer is an admirer of the bureau system of the Navy Department, so far as the division of labor and responsibility is concerned, and would be sorry to see any one of the bureaus subordinated in its present principal work. But the appropriation of money direct to

the bureaus works for evil in giving them an independence that they should not have in such an organization as the naval establishment. One of the greatest benefits to be derived from the proposed change is the easy means it would afford to facilitate the consolidation of shops, foundries, etc. at the navy yards, and other consolidation of similar effort throughout the establishment. With the lumped appropriations, the one machine shop, the one foundry could at once be established on an economical businesslike basis at each navy yard, placed in charge of any kind of officer the Department might choose, and then run without hindrance. We could have the one accounting office, which would keep track of every cent of "costs" for all the departments and shops. In fact, this would become necessary were the consolidated shops run as they should be—independently of any particular bureau's control. There would be no more "my" money, and in its place would be "our" money. A welcome sound, that word our, indicating more chance for real co-ordination between the bureaus. In consolidating the appropriations, the excellent bureau organization of the Department would be maintained, while at the same time the bureaus would be shorn of a large amount of their independent power, which is one of the reasons for the bureau organization's unpopularity with many.

This is one of the places of particular emphasis in this paper, and the readers are urged to tarry a little and think. The writer sees before him almost a revolution in the administration of the naval establishment, should the individual purses of the various bureaus be taken from them and emptied into a single strong box, unlocked and locked only by the Secretary of the Navy. He is confident that the change would not only work for quickened efficiency, but would save much money, without destroying the usefulness of any bureau. There is with us now an example, on what might be called a small scale, of the change proposed. It is the appropriation Freight, which is provided for paying all the freight charges for moving navy material. Before it was created, a few years ago, each bureau paid out of some one of its appropriations the cost of shipment of articles under its cognizance, a fact that often created situations so ridiculous as to be beyond the belief of persons outside the navy, and constantly wasted money. Congress finally saw the wisdom of making lump appropriation for the purpose; and Congress, it is hoped, will some day soon see the wisdom

of making lump appropriations for all the other main items of expense.

At this point is a good place for an illustration or two. A number of years ago at one of the navy yards, an old structure was converted into a combination office and stores building, containing the offices of three of the yard departments. There was no central heating plant in the yard. Two of the departments erected expensive steam heating plants in opposite ends of first floor, and the third led in steam for itself from one of its adjoining buildings. This situation continued for years without an indication from anyone that he appreciated there was a joke living right in that building day and night, so sot were our minds along the lines of the inviolability of bureau appropriation rights. Finally, one night, there was a difference of opinion among some electric wires in the building, and the three heating plants passed away, never to be replaced.

To-day, at each of three of the navy yards, there are two mighty testing machines of one hundred thousand pounds capacity, alike, being from the same maker, and having been purchased under two different appropriations, and costing a mint of money. The largest ship-building plant in the world, were it ten times its present size, would have but one large testing machine; and yet these yards, of not nearly the same importance, have two each, the situation being due to the sharp line of division drawn by the fact of the separate bureau appropriations. Unpardonable, a system of appropriating money that encourages such waste.

Other similar stories could be told, but these are sufficient for the argument.

Congress could consult all of the estimate cards, including those of the very outer circles, if it wished, or those of just as many circles as it chose, in order to study the question before passing the bill; but the bill, when passed, would be a short, dignified document that would leave to the Navy Department the full latitude it should have in spending the money granted for its support.

The estimate cards would soon be worth their weight in gold, in the management of the business affairs of the navy, and they would not require any expensive or intricate bookkeeping, or any additional force. How few persons connected with the service have a good-for-anything idea of the cost of doing things in which they are interested. It is believed that a large proportion of the

officers and civilian employes having supervisory power, of more or less extent, at the yards and in the Department at Washington, have no working idea of the cost of the jobs at which they and their subordinates labor, or of the "group" to which they belong, and that there are many who have no knowledge at all of the matters. The fact that the means are always controlled, is one of the best aids to sound commercial organization. Many of us in the navy are like children with money given them for candy. We do not care how hard it was to get the money; we want to spend it right away; and we want to spend it for just the kind of candy we like. The spending of money is an interesting task for all; the getting of it is generally an irksome job; and accounting for it, absolutely dry, and often irritating.

The cards would bring out much that should be brought out for honest reasons; would furnish excellent means of comparison between groups engaged in similar work at different places; and would constantly be teaching us the worldly, the money value of what we are doing in our day's work to make the navy the best in quality in the world. As they were passed down, they could be corrected, of course; but such correction would not entail the erasure of the original estimate, the corrections being entered in red ink over the estimate number of the parent group.

In the Bureau of Supplies and Accounts would be kept accounts similar in style to those at present, but more useful to all hands. Each expenditure of value would be recorded there under the appropriation head to which it belonged, and there would be further divisions, where necessary, showing to what ship, yard, or bureau an expenditure was chargeable.

In the estimate work no one should estimate for anything that does not come within his "trade." The permanent officer-personnel is made up of gentlemen of a number of "trades." There are the Church; the University; the Law; the Hospital; Ship Design and Construction; Civil Engineering; Ship-machinery Design, Construction, and Control; Supplying and Accounting; Ordnance Design, Construction, and Equipment; General Ship-equipment; and Ship Control, and Command. Each trade should furnish its own workmen with their "tools," if possible. The doer of the job, the manufacturer, should estimate for the labor and material for the shops and foundries where the work is to be done. There is too much of the vesting of both the directive and execu-

tive forces, concerning a whole element, in some one bureau or office; and such method is generally against the foundation principles of effective and economical organization. As an example: Some years ago one of the bureaus purchased, or had built a fleet of lighters for its exclusive use, and thereafter claimed the right to have entire charge of them, even to making the necessary repairs to their hulls. The bureau was not of the trade of ship construction, and had no right, within common business sense, to make the repairs. In this age of the rapid increase in the highly civilized population of the world, and the consequent close financial connection of the human units, the popular some-one-man way of doing things must go, and in its place be substituted system as unchangeable, except for amplification, as the orbits of the planets (astronomical exactness ignored), system beyond the whim or ambition of a mere unit, in power for some brief period. Few members of this busy world of doing of to-day can turn out a completed new idea, ready for instant use by those in need of it. All are becoming specialists, per force, because there are only twenty-four hours in the day. One man may have a foundry brain, with only time to cast ideas with his rugged and grand mental strength, while others with finishing, polishing, or promoting brains pass these ideas along to the hands of the common users. A bureau does not necessarily have to control the work of the personnel of the "trade" it most nearly represents, but, generally, it points to economical efficiency to have it do so, on account of its better understanding of the technical capacity of the units, from whom it is likely to obtain more telling work, in the aggregate, than a bureau that has never been apprenticed to the trade.

The following is a striking example of how one "trade" may suffer through having another trade furnish it with tools for work. The Bureau of Yards and Docks, manned entirely by civil engineers, furnishes navy yard commandants' offices with working supplies, such as stationery, typewriters, furniture, etc.; in fact, in this respect, such offices are treated as if they were directly under the cognizance of the civil engineering trade. But the commandant of a yard is not of that trade; he belongs to the "Ship Control, and Command" trade (see page 63). In a certain commandant's office, not long ago, the typewriting machine wore out; wore out in the strictest sense of the term, for, when the expert was called in, he declared it beyond the hope of even the most eco-

nomical administration; it had gone to pieces as did the one-horse shay. That commandant was no government spendthrift, but he promptly put in a requisition for a new machine. Word came back from the Bureau of Yards and Docks that the money could not be spared. The commandant then wrote to the Secretary of the Navy, stating the pitiable plight of his office, and inviting attention to the fact that there were eight months yet to the beginning of the next fiscal year. He wound up his letter by asking the kind Secretary to buy him a typewriter from Contingent Navy, a small appropriation for incidentals, not covered by any other appropriation, and under the direct control of the Secretary. He got a perfectly legal answer, and no typewriter. This was the case of the commandant of a large yard, who had to get out dozens of letters and other papers of importance every day, and yet things so arranged themselves he had to go without the use of a writing machine for eight months, unless he commandeered the Doctor's or the Marine Officer's, which step would cause him to butt up against still another trade, and cut off the flow of typewritten poetry from the office sergeant or the hospital apprentice. The writer never heard the sequel to this sad tale. The commandant's typewriters, stationery, etc. should be estimated for by that group of the inner, first circle styled "Navigation."

Why should the Bureau of Construction and Repair control the kinds, quantities, and style of so many articles of ship's equipage and supplies? The bureau is manned exclusively by naval constructors. Why should it decide how many spit kids are to be carried on a battleship, or what style of easy chair the admiral may have in his cabin? The Hospital trade has even a better right to decide in both cases. No, it is all wrong. "Ship Construction" has no more right, from the viewpoint of economical efficiency, to have complete control of an important portion of the sea allowance than it has to determine the size of the paymaster's safe or the quantity of paregoric to be carried in the sick-bay chest. What would be thought, if, in the case of the Bureau of Supplies and Accounts, which makes the clothing for the enlisted men, it was ordered that hereafter that bureau prescribe the style of uniform for the navy and determine the number of each kind of garments a man must own? Surely, "wild" would be the mildest word of criticism. Yet such a condition would parallel that just mentioned.

Some years ago, an ambitious general storekeeper, at a busy

yard, determined it would be a good thing to have a motor truck for delivering supplies to ships at the water front. The Bureau of Supplies and Accounts approved the idea, and the Bureau of Yards and Docks was asked to authorize the purchase. This was refused. Then Supplies and Accounts sat up for several nights reading law, and decided that it would be perfectly legal to buy the truck from the appropriation "Contingent, Supplies and Accounts," the one, it will be recalled, that is used for buying machinery for the clothing factory, ice for the water coolers of the pay offices, tolls, and other similar things. When the purchase had almost been made, Yards and Docks heard of the move. A call to arms was sounded in that camp, and in short order Supplies and Accounts was politely but firmly notified that if the truck was bought, it would be seized at once, carried off to the yard stables, and there locked up with the oxen and timber-wheels. As the regulations give the civil engineers charge of everything on wheels or hoofs, including the devil wagons, the truck was not bought. Maybe the general storekeeper still requisitions the yard railway train—a locomotive and flat car—to carry a hatful of supplies to a ship; or, in case the train be away hauling a monkey wrench or so for some other department, takes the bull by the horns, and sends the stuff down to the ship in a handcar, pushed by a dozen or so husky voters at a pace that would make a snail blush and hurry out of sight. The "trade" of civil engineering is not the one to determine whether or not a general storekeeper should have a delivery wagon.

That grand resource of the navy, the permanent personnel, obtained by means of the one original resource, MONEY, is under the direction, as to its application to the work on the "jobs," of the Secretary of the Navy, who divides his assistance in such control among the several bureaus. To these executive aids is allotted the use of a large portion of the personnel resource, and among them is divided the money furnished by Congress. But the bureaus do not represent principalities within clear, uncrossed dividing lines. There are portions of the personnel resource that, directly or indirectly, are under the influence of more than one bureau, and there are portions of the money resource that cannot be expended properly by one bureau without advice or suggestion from another. This necessitates co-ordination in order to accomplish. What an acceptable, inspiring word co-ordination is. The

mention of it brings one's thoughts to peaceful achievement, to modern triumph over that business demon, WASTE. In the navy it means something like the general peace in Europe, where the dusty boundary stone is not needed to mark division between neighboring mighty states, the demarkation being more clearly shown by unbroken lines of waiting bayonets. Such is co-ordination to-day among the bureaus.

Looking down at the words on the badge pinned to our lapel, "Economical Efficiency," as a reminder to keep on the right path in this discussion, it must be admitted that there should not be allotted to any one of the bureaus more personnel resource or more money resource than is actually necessary to complete the "jobs" *assigned* to it; and it should be remembered, above all things, *a job should not be duplicated.*

In making up the estimates, it will not do to depend entirely on precedent, on past records, for these will be found too often to represent waste, although, in some instances, it may be just the reverse, representing the starvation of efficiency, due to unbusiness-like administration. The estimates should be evolved from concrete calculation, and this can be done only by knowing the "costs" of the sub-sub-divided sub-jobs that must be done to obtain the result called Maintenance of the Navy.

But in the organization of a naval establishment it will not do to base the system on a limited resource of either money or men, as would be the case in commercial life. The function of a navy should be treated as a vital necessity for the very existence of a great nation. First, it must be found out, after the *kinds* of resources at command have been determined, just what "jobs" are necessary to maintain the navy at that state in which its full vital duty may be performed; and then calculate what amount of these resources or forces are required to complete each yearly job, each one of the thousands which, as atoms, go to make up the one great public force called the NAVY. These minor forces added together will make the totals that will show the actual resources that must be forthcoming to make complete the navy. Nothing but a *complete* navy can be considered, for a navy otherwise would be as an incomplete man, one without an arm, leg, or eye, for instance. This calculation is the crux of the whole thing, for an error towards over-calculation might bring on that disease so fatal to sound organization, plethora of resource, and consequent som-

nolence of the mental machinery of the personnel; and a mistake in the other direction, under-calculation, might bring not disease but violent death, through crashing of the parts not sufficiently strengthened or oiled.

What task should be more fascinating to the intellectual naval officer of to-day than constant endeavor to approach nearer and nearer to the ideal, the perfect allotment of the two great resources, personnel and money, to the atomic jobs that make up the whole establishment, ready for action?

II. SYSTEMATIC GENERAL EXAMINATION INTO NAVY YARD DEPARTMENT EXPENSES WILL PROMOTE EFFICIENCY AND REDUCE THE COSTS.

The alphabetically-titled accounts, described at the beginning of this paper, show only for what purposes expenditures of value have been made. All that the vouchers of the disbursement officers show is that money has been paid out for purposes covered by the appropriation act. And general storekeepers receipted invoices show only that stores have been issued from stock to yard departments or ships. What shows that all of the expenditure of value was *necessary* for maintaining the navy in that state of efficiency prescribed by those in supreme control, or for the results attained? Nothing.

The orderly recording and periodical presentation of the "costs" of things, and the vouching for the expenditure of value that goes to make up these costs are all very well, but with these we should be far from content, because there is one vital point unsettled, and that is, *is the final cost of all the output as low as it should be?*

The navy is a collection of ships for war and international police purposes, moved by the force of a personnel controlling the force of the materiel, and supported by an establishment of yards, stations, offices, etc., controlled also by the force of a personnel, interwoven with or related to the controlling personnel of the ships. Of the finished product, the warship in commission and beyond the control of the land establishment force, there is little to say. Admitting the absolute necessity for that product, finished as it is to-day, its administration, away from the navy yards, is apt to be economical enough, comparatively speaking. It is about the

accounting for the necessity for the expenses of the huge establishment that supports the fleet that there should be concern.

Eighteen millions of dollars, in round numbers, of the one hundred appropriated for the navy's support for a year, are spent to pay the wages of labor at the navy yards. This amount is nearly equal to what it costs to support the fleet in commission. The accounting for the actual disbursement of these eighteen millions is thorough, too thorough, perhaps. The accounting for why the money was spent is simply the unregulated and generally unexamined show of results, with little or no proof that the results equal the values expended.

It cost for the fiscal year 1906 the sum of $23,655,950.41 to maintain all the ships in commission. There was spent for repairs to hulls, machinery, and equipage of the ships $5,550,309.01. Thus the total cost of the floating part of the establishment, during the year, excluding cost of new construction ($31,764,556.58 alone) was $29,206,259.42. It cost during the same fiscal year, to *maintain* (Title G) all the navy yards and other shore stations $11,115,080.81. Besides this there was expended for buildings, chattels, etc., and for machinery at these places (Titles E and F) the sum of $9,589,183.09, making the total of the real maintenance cost of the shore part of the establishment $20,694,263.90. Of course this latter figure does not include the work done at the yards on or for ships; it is solely the cost of keeping the yards in such shape as to fit them for doing their work for the floating part of the establishment. This cost alone of maintaining the shore plant was more than two-thirds the cost of the floating part, the fleet.

Bear in mind that these twenty and a half millions expended in one year in keeping the fitting-out and repair plant in condition to do work for the fleet are not all the money used at the navy yards. Look above and there will be noticed an item of five and a half millions, repairs to ships, under Titles D and P, all of which work was done at the navy's shore plant. Another half million, spent for work mostly at shore stations, was under Title N, experiments and tests, which title was charged in 1906 with $498,520.09. Under the manufacture account, Title Z, at the navy yards, the enormous sum of $22,447,347.02 is charged off. Also, about three millions and a half of construction work on new ships was done at the yards during the year. So it may be safely stated that over

fifty millions of dollars are used at the shore plant in one year, about half the total appropriation for the navy.

Of the eighteen millions spent at the stations for labor alone, the large proportion of five millions was for "general maintenance." (Title G), nearly a million and a half more than was expended for labor in repairing ships. In addition to this five million dollars worth of labor used for the general maintenance of the shore plant, over a million and a half was disbursed for labor under Titles E and F, buildings, chattels, machinery, etc. at the yards.

This navy yard expense is one of the most important items in the navy's unfinished business portfolio. The amount involved is enormous, and the duty in regard to it is clear. It is the writer's opinion that the "costs" can be kept down to near the necessity point only by constant inspection from the outside, combined with enforced competition between the yards, in doing similar work.

The marked development of practical interest in the science of accounting, in recent years in our country, means that it has become an integral part of existence under the conditions of high civilization. Note the formation of accountants' societies throughout the United States, which do not seem to be for mutual support in warfare against the employer, but mainly for the purpose of advancing the science, in order to meet the stupendous demand issuing from the increasing complexities in financial relationship. There has recently been organized at Washington a society of government accountants, an earnest body of men who, so far, have not talked of personal advancement, but have confined their efforts to the undeveloped state of government accounting. The navy, with all the rest, must meet this situation: the demand of modern business conditions for *real* accounting in all financial, all property relationship.

Linked to this modern science of accounting, in fact, practically a part of it, is the work of examination, inspection, audit. "Public" accountants are financial inspectors, and in the commercial life of to-day public accounting is a profession. A visit from the public accountant is not considered any more of a disgrace than a doctor's visit, the question of disgrace depending on the nature of the disease. But be assured that the professional healer is not disgraced at all, no matter what the trouble may be.

Military general-inspection has been considered always an hon-

orable institution, necessary for efficiency's sake; and has existed, it is supposed, for centuries. The inspector general is one of the most important officers of the War Department. After all, the inspector is but the eye of the commander carried to ranges where the ordinary optic of that gentleman will not reach and where it is not convenient to place his physical presence.

It is idle to say, in sonorous tones, that general inspection is not needed in the navy, that inspection, from the outside, of this navy yard work, the labor of which alone costs eighteen millions yearly, is not necessary, for the reason that all the yard departments are in charge of honorable men. Of course the departments are in charge of honorable men, but there are hosts of honorable and intelligent men who need some sort of supervision all the time. There are many yard department officers who are not inflicted with ingrowing consciences in the conduct of their navy yard work, as related to the regulations of the central power at the Navy Department: and might there not be need of some monitor to keep these same consciences from sprouting in the other direction?

The inspection of navy yard department accounts is not a new subject. The paymaster general, in his report for 1899, had this to say:

"Attention is invited to the propriety and necessity of establishing a suitable inspection of navy yard accounts in the manufacturing and constructing departments. The present regulations provide methods for obtaining the cost in labor and material of all products ranging from a completed ship to individual items of her outfit. Experience has shown, however, that without careful and frequent inspection of these accounts they may be irregularly or improperly kept, thus defeating the object of the system. As no inspection is now held, defective or neglectful practices come to the Bureau's knowledge only in occasional instances; too late to apply the proper corrective, and also too late to fix responsibility for lax methods, owing to the constantly shifting personnel of officers and clerks in navy yard offices."

In his report for the following year, the paymaster general again referred to this subject, in these words:

"Attention is again invited to the subject of the inspection of accounts in the manufacturing and constructing departments of navy yards. The importance of legislation to this end was urged by this Bureau and repeated by the Secretary of the Navy in the annual reports of last year. A bill to this end was favorably reported by the House Naval Committee, and is now on the calendar.

"The principle of inspection of accounts is generally recognized as essential to the proper conduct of vast business, whether of Government or of corporations. . . . . Under the War Department there is a special corps, the Inspector General's, whose scope is of the broadest kind, ranging from military drill or equipment to the condition of pecuniary accounts and balances. Corporations have their auditors and examiners. . . . . But there is absolutely no inspection of the many offices at naval stations, through which are administered the millions paid for labor."

The reference of the paymaster general to Congressional aid is explained by the fact that it was the Department's desire, at the time, to appoint a civilian as inspector, and to have the position carry with it naval rank. This brought in the personal element, resulting in the bill being killed by those who likely had given no thought to the merits of the scheme.

At that time, in departmental correspondence, all of the bureaus admitted the advisability of outside inspection of navy yard department accounts and showed a willingness to co-operate; but a decided unwillingness to have the inspector chosen from civil life was expressed by several of them. There were suggestions that the inspector be selected from the pay corps, and others that the inspection to be made by a board, consisting of a pay officer and another officer, of mechanical training. Nothing came of the matter; and a project to promote efficiency and economy to a marked degree was allowed to pass out of sight, actually, in the cloud of extraneous matter surrounding it. If it can be revived, let us not hesitate long over the question who shall make the inspections. The main thing is to inaugurate them, even if they are made at first by the night watchman. No person should be allowed to make such inspections whose official self is persona non grata to any of the bureaus interested. The healthy pride of each bureau must be respected scrupulously if there is to be sound administration. If the two-officer board is acceptable to all bureaus, then let us have it. If a pay officer alone is acceptable, then let the inspections be made by such an officer. If the bureaus will not agree on the subject, then have each bureau's work inspected in the way it wishes, provided the same plan of thoroughness is followed. There is no economy in friction, and it would be cheaper to have several inspectors than to have but one who had to keep bucking against official enemies. But let us have the inspection first, last, and for all time.

Before leaving this particular subject, it will be well to give an

example or two of what would have been prevented had there been anything like a system of inspection of navy yard accounts.

Some years ago a department of an important yard became so helplessly entangled in its manufacture and other shop accounts that even expert aid, sent on from Washington, could not unravel the snarl. Finally everything had to be written off and new books opened. The trouble was the accumulation of years, but it would not have been of more than a quarter's duration had there been an inspector to stop the "cooking" of the accounts.

At another important yard, a head of department, who had only recently taken charge, in trying to clear up the manufacture account, Title Z, turned over to him, found worse than confusion. There were hundreds of dollars charged to unfinished job orders, where all the research possible could not bring out what the job orders were, for what the value had been expended. He closed up many recognizable orders, that should have been closed long before, but when he invoiced the products to the general storekeeper, he learned that that official knew nothing about them. They had disappeared from off the face of the yard. This mix-up also had to be pressed out by force of temporal power instead of intellect.

When one of the double turreted monitors was about to be placed in commission some years ago, it was discovered that the furniture for the vessel bore ridiculously excessive prices. The manufacture of this furniture, made at a navy yard, had extended, at least on paper, over a number of years, and the job orders covering, being left around loose, must have had tossed into them all sorts of stray expenditures for labor and material. For when the accounts were closed, the furniture was invoiced into store, from the yard department that made it, at a total price of $16,129.00, although a board of experts immediately appraised it at the value of $3249.00, the difference, $12,880 being charged to "waste."

The British have an inspector of "Dockyard Expense Accounts." The paymaster general brought this fact to the attention of the Department in 1899, quoting from that very interesting and instructive book, Sir Vesey Hamilton's "Naval Administration." That author, after referring to the creation of the office of inspector, upon the report of a committee headed by Vice-Admiral Graham, to enquire into the administration of the dockyards, states: "That committee, in addition to pointing out the inade-

quate supervision of dockyard labour, the waste of both labour and material, the idleness, defective management, duplication of accounts, over-employment of clerks, and useless operations that were found at the dockyards, reported that the yard accounts were unaudited . . . ." He then refers to the inspector's work as being "exceedingly valuable."

III. ENFORCED COMPETITION BETWEEN THE NAVY YARDS WILL PROMOTE EFFICIENCY AND REDUCE THE COSTS.

Systematic comparison of the cost of similar work done at the various yards has never been made by the Department. Some comparisons will be given here to show what a field there is for work in this line; and it is thought that the results exposed will indicate that sincere work will accomplish enormous economy in yard shop work and that connected with the general upkeep of the yards. The writer's task in collecting data for these deductions was difficult. Had such comparisons been required by regulation, and the necessary data at hand, under a regular system applying to the day's work, it would have been, instead, analogous to that famous job known as "rolling off a log."

Three navy yards, designated as the Blue, Red, and Green yard, respectively, will be handled in the comparisons. The great departments of Construction and Repair and Steam Engineering will be the ones used in the comparisons between the yards. The Blue yard will be arbitrarily taken as standard. The work performed during the fiscal year 1906 will be that compared.

In this study the reader should have clearly in mind the reasons for the existence of the yards; and it might be stated now that those used in the following comparisons are regular navy yards, no station for special work being included. The main purposes of the navy yard are to build and repair ships, and to supply, manufacture, and repair fittings and equipage for the same, to furnish general supplies for the fleet, and to conduct experiments and tests relating to such work. All efforts on these lines will be called "output" work in what follows. Value expended for other purposes must be considered as having been expense necessary to maintain them in condition to do this output work. What the yards should be judged by are the cost of the "output," and the expense of maintaining the plant from which it came. Output work is charged to one of the five titles, A, D, P, N, and Z, origi-

nal construction, repairs to hull and machinery, repairs to equipage, experiments and tests, and manufacture. The cost of maintaining the plant for doing this work is chargeable to one of the three ledger titles, G, E, and F—general maintenance, real estate and chattels, and machinery.

The work of the Construction and Repair Department of the three yards will be the first taken up for comparison.

AN ACTUAL COMPARISON OF THE COST OF SIMILAR WORK AT THREE OF THE NAVY YARDS, IN THE CONSTRUCTION AND REPAIR DEPARTMENT.

At the standard yard, Blue, during the fiscal year 1906, there were performed 273,917 days of labor (not clerical) work, at a total cost of $655,238.86, or an average daily wage of $2.395; at the Red yard 224,156 days of "labor" work were performed, at a cost of $589,860.91, or an average day's wage of $2.631; and at the Green yard there were 66,199 labor days, costing $155,771.26, with a daily average of $2.353.

As wages for labor (not clerical) vary with the geographical location of the yards, it was necessary to ascertain the percentage of variation in the cases of the wages of Blue, Red, and Green, taking the wages of Blue as standard, and apply the results to the average daily wage, in order to make a fair comparison of the cost of the "output" work. Calculating from the pay of all the trades common to the three yards, it was found that the wages of Red were 4.223 per cent in excess of Blue, and that those of Green were 5.418 per cent in excess of Blue. Applying these percentages to the average day's wage stated above, there are obtained, in the way of comparison, the following:

Blue yard—average daily wage paid for labor	$2.395
Red yard " " " " " "	2.524
Green yard " " " " " "	2.232

Here is the first result of interest: that is, Red employed a higher character of labor than Blue, and Green, on the contrary, employed a lower character, *to perform similar work.*

The next question is how to make anything like a just comparison of the cost of similar work at the three yards. The writer thinks he has a method that will stand the judgment of the naval world.

It will not do to use "labor" from which to fashion the meas-

uring rod, because, under the present system of navy yard management, labor can be brought into a yard as long as there is money to pay for it, whether there is honest work there for it or not. There is no way of dividing *all* the output into distinctive and comparable pieces, ascertaining the real costs thereof, and then making the comparisons. Work under Titles D, P, and N could not be moulded to such a method, for comparison between yards.

The measure that the writer has adopted is the value of the material used in the output work. Cost of labor can be wasted by idleness, but the material drawn from store for the work cannot disappear in this way. The material must either go into the jobs, be returned to store, or be kept unused in the yard department shops, contrary to regulations. In most cases it is a mechanical impossibility to put more material than necessary into a job, and have the job completed in the way intended. If material is turned back into store, proper credit is made to the job concerned. There is a limit, well in sight, to the amount of material, unused, that can be hoarded in the yard department shops. So the more thought given to it, the better this " value of material used " seems to be as a measuring tool.

Let us now use this measure in the case of the three yards selected, and examine the results.

The material used at the yards in output work, during the fiscal year 1906, was as follows:

	Blue Yard.	Red Yard.	Green Yard.
Title A.....	$ 1,751.48	$ 1,686.94	$.....
" D.....	97,314.48	80,191.01	14,741.29
" P.....	2,258.50	3,063.87	1,840.47
" N.....	1,462.54	211.21	.....
" Z.....	169,651.55	119,724.16	11,345.86
Total	$272,438.55	$204,877.19	$27,927.62

The wages paid for the labor, charged to the same titles, were as follows:

	Blue Yard.	Red Yard.	Green Yard.
Title A (ship construction).....	$ 55,787.01	$ 41,565.53	$.....
" D (repairs ships)	296,700.11	264,448.65	34,446.99
" P (repairs equipage)	11,476.99	11,417.65	3,466.28
" N (tests, etc.)	4,377.76	1,988.70	1,003.80
" Z (manufacture)	114,273.19	110,782.84	14,991.83
Totals	$482,615.06	$430,203.37	$53,908.90

The labor totals of Red and Green must be corrected for difference between rates of wages on account of geographical location. As stated before, wages at Red are 4.223 per cent higher than at Blue, and those at Green, 5.229 per cent higher. Making the corrections, there are obtained for comparison the following total values of the labor applied directly to output work at the yards:

Blue	$482,615.06	worth of direct labor
Red	412,772.01	" " " "
Green	51,138.23	" " " "

Dividing these totals by the corresponding totals of material:

Blue	$272,438.55	worth of output material
Red	204,877.19	" " " "
Green	27,927.62	" " " "

gives the worth of direct labor employed for each dollar's worth of material used in output work as follows:

Blue	$1.771
Red	2.015
Green	1.831

These results make interesting study; and yet it will not do to have them stand as final, for there has been ignored all else in the way of expense, that led up to putting the yards in daily condition to enable the fractional part of the whole labor to perform directly the "output" work. So, in conjunction with these results, there must be consulted the results of still another comparison, in order to arrive at a just comparison of cost of the output work. As indicated, this relates to the important matter of the expense of administration and general maintenance at the yards.

After making the necessary corrections in value of labor, for difference in rates of wages on account of location, the cost of "maintaining" the Construction and Repair department at the three yards, for the fiscal year 1906, was:

Blue	$182,289.76
Red	201,618.85
Green	79,653.23

which is the total of the labor and material charged to the Title G ledger account, except the amount of pay of naval officers serving in the department, which, owing to a defect in the system of accounting, cannot be obtained in detail beyond the lump sum for all the officers at the yards, regardless of departments. Keep in

mind that this expenditure for maintenance was for the sole purpose of making it possible to perform the "output" work.

Dividing, in the case of each yard, the cost of maintenance, just stated, by the total of the material used in the output work (see page 70), there is obtained the following:

Each dollar's worth of material in the output work required at

Blue	$0.669	worth of maintenance
Red	0.984	" " "
Green	2.852	" " "

These last results show, taking the material used in "output" work as a measure, it cost 47.1 per cent more at Red than at Blue to maintain the working plant, in the Construction and Repair department, to perform the same class of work, and that at Green, it cost 326.3 per cent more. What a showing!

Adding, in the case of each yard, the cost of direct labor for each dollar's worth of output material to the cost of maintenance for each dollar's worth of output material, gives—

The total of direct labor value and general expense for each dollar's worth of material in the output work as follows:

Blue	$2.440
Red	2.999
Green	4.683

This means that output work at Red was 22.9 per cent, and at Green 91.9 per cent more costly than at Blue.

Let emphasis again be put upon the fact that, in the long run of a year's time, the output work, at the regular yards, is bound to sum up to the same character. It would require the clearest, practical exposition from one of these yards of comparison, to convince the writer that its average yearly output work was of such a character that less material and more labor were necessary than at the other yards.

The results just obtained, besides showing that the Construction and Repair department of Blue is more economically efficient, to a marked degree, than that of the Red yard, emphasize, in a mathematical way, the fact of the costliness of maintaining small navy yards or stations, those pests to the luxuriant growth of *economical* efficiency in the naval establishment. Doubtless the reader has discovered, ere this, that Green is "small."

The following is another comparison, perhaps more interesting than useful, which is put down here for what it is worth.

The totals of the days of *clerical* work for the year, in the Construction and Repair department of the three yards, and the aggregate amounts paid as wages were:

Blue	20,116 days	$58,994.84
Red	12,952 "	36,718.29
Green	2,355 "	7,587.82

making the average daily wage for the clerical force at

Blue	$2.833
Red	2.835
Green	3.222

Dividing the amount paid for clerks' wages by the value of the output material for the year, gives the worth of clerks' wages for each dollar's worth of output material. The results of this are:

Blue	$0.217
Red	0.179
Green	0.272

As under this heading are included the wages of draftsmen and all others of the office force, it will be seen that Red figures up a little better than in the preceding comparisons. No question of difference of the office wages on account of geographical location of the yards is involved, as in the case of "labor," for in the classified service, as related to the Navy Department, wages have not been tempered for the shorn lamb, even if pie does cost twice as much Green yard way than in Crackeye Town, Kansas, "his" starting place, or at Red yard town, where the "other fellow's" job is.

The amounts of labor and material values expended during the year to Titles E and F, real estate and chattels, and machinery, although going in for the support of the yards, cannot very well be compared, as such expenses vary greatly different years, and do not vary in the same proportion for the different yards. One year a certain yard may have a lot of extra work done along these lines, while at another there are only the ordinary expenses. But there is no reason why, with a thoroughly finished system of comparison, these charges should not enter somewhere finally in the cost of maintenance. The amounts expended for these purposes, in the Construction and Repair department of the three yards, were:

Blue	$193,187.68	(total under E and F)
Red	74,512.82	" " " " "
Green	84,949.85	" " " " "

The writer is suspicious of these last figures, for E and F. He could give a reason, but in doing so there would be danger of discovering to others the identity of the yards of comparison.

AN ACTUAL COMPARISON OF THE COST OF SIMILAR WORK AT THREE OF THE NAVY YARDS, IN THE STEAM ENGINEERING DEPARTMENT.

Passing to the Steam Engineering department of the three yards, it will not be necessary to go into as much detail as in the case of the Construction and Repair department, now that the system of comparison is understood.

The average daily wages paid for labor were:

Blue	$2.475
Red	2.522
Green	2.397,

the results including the corrections to standard Blue for difference in wages on account of the geographical position of the yards.

It may be noticed here, though perhaps of no importance, that the average wage at Red, for Steam Engineering, is practically the same as the average wage for Construction and Repair. Also, that in Steam Engineering, at Red, the *character* of labor used is higher than at Blue, just as it was in the case of Construction and Repair; and that the character at Green is lower than at Blue, just as it was in the case of Construction and Repair. This latter development is most interesting to the writer, and he wishes, through simple curiosity, that he had the means of getting at the reasons.

The total paid for the wages of labor charged directly to "output" work, that is, to Titles A, D, P, N, and Z, in Steam Engineering, corrected for geographical location, was:

Blue	$247,694.91
Red	227,113.56
Green	12,879.26

The total value of material charged to the same work was:

Blue	$168,099.58
Red	93,457.99
Green	17,846.44

Dividing the value of the output labor by the value of the output material, gives—

The worth of labor for each dollar's worth of material used, as follows:

Blue	$1.414
Red	2.430
Green	0.722

Here is certainly food for thought.

As was done in the case of the Construction and Repair department, the cost of maintenance of the whole Steam Engineering plant, as related to the value of the output material, will now be compared. Making the corrections for difference in wages, on account of location, the cost of general maintenance of the department at the three yards, during the fiscal year 1906, was:

Blue	$128,046.19
Red	120,411.16
Green	29,190.18

Dividing, in the case of each yard, the cost of maintenance just stated, by the value of material used in output work, shows that—

For every dollar's worth of output material used, there was expended for the maintenance of the Steam Engineering plant:

Blue	$0.761
Red	1.289
Green	1.636

This might be taken to mean that at Red it cost 69.4 per cent more than at Blue to maintain the plant in doing the same kind and amount of output work, and that at Green it cost 115 per cent more.

Adding, in the case of each yard, the cost of the direct output labor to the cost of general maintenance, for each dollar's worth of output material used, gives, for the Steam Engineering department:

Blue	$2.175
Red	3.719
Green	2.358

which means, according to the writer's method, that output work at Red, in this department, was 71 per cent more costly to the government than that at Blue, and that the same kind of work at Green was only 8.4 per cent more costly than at Blue.

The little Steam Engineering department at Green seems to show up pretty well, for a good portion of its heavier cost for maintenance was no doubt due to Green being a " small " yard.

Comparing back to the Construction and Repair figures on page 78, it will be seen that in the case of the Blue and Red yards it cost more to maintain the Steam Engineering department, per dollar of output material, than the Construction and Repair department; but that at Green it cost considerably less. During the writer's investigations, most of the data examined pointed to extreme economy of administration on the part of Steam Engineering at Green. Notice how the figures of deduction also point that way. If these comparisons be based on anything like a just method, do they not expose WASTE? Think of it costing 71 per cent more at Red than at Blue to do the same kind of work, both yards being practically equal in resources!

The average daily wage of the clerical (office) force of the Steam Engineering department of the three yards was:

Blue	$2.788
Red	2.997
Green	2.824

Dividing the amount paid for clerks' wages by the value of the output material, gives—

The worth of clerical wages for each dollar of output material as follows:

Blue	$0.138
Red	0.181
Green	0.166

These results indicate that at Red the clerical work, in the Steam Engineering department, cost 31.2 per cent more than at Blue, and that at Green, it cost 20.2 per cent more.

The value of material and labor, with labor value corrected for difference in wages on account of locality, expended in the Steam Engineering department to Titles E and F (real estate and chattels, and machinery), was:

Blue	$42,094.07
Red	16,097.07
Green	16,890.69

It seems strange that these E and F expenses at Blue, in the Steam Engineering department, were so much heavier than at

Red, just as they were in the case of the Construction and Repair department. The writer does not believe the truth is in the figures; but there should be nothing but truth recorded in the final books of entry. Otherwise we are spending money for maintaining a system of accounting that does not always account.

There is not room here to follow with comparisons of the work of other yard departments. It would not only lengthen the paper beyond the limit, but would choke its vitality with figures, ere it had performed its mission of holding, to the end, the studious attention of all its readers. The writer believes that the same showings would come from the other departments. All are under the same influences, good or bad, and the human part of the machinery, in each case, is identical in character. The departments used in illustration in this paper were chosen as being best fitted for the purpose, on account of having the largest pay rolls.

AN ACTUAL COMPARISON OF THE COST OF SIMILAR PIECES OF WORK AT SEVERAL OF THE NAVY YARDS.

After the writer had invented his method and made the preceding comparisons, it occurred to him to compare the cost of similar pieces of work turned out at the yards, that is, articles of ship's equipage manufactured under Title Z, one of the elements of the "output" work. The work of four different yards, including Blue and Red, was compared.

The boats for the battleships are built, as to kind, on the same model and of the same material. Recently, at one yard, it cost $1890.63 to make a 30-foot steam cutter, while at another, not many miles away, it cost $2684.62 to build exactly the same kind of boat, to put on board the same kind of battleship. A 30-foot barge cost $671.08 at one yard and $1151.00 at another. Several 30-foot cutters cost, on the average, $598.61 at one yard and $848.13 at another. A 14-foot dinghey cost $104.08 at one yard, while at another the same kind of boat was turned out for $153.61. A 16-foot dinghey cost $104.17 at one yard and $196.34 at another —pretty close to twice as much, it will be observed. A 20-foot dinghey cost $217.89 at one yard and $362.44 at another. A 30-foot gig whaleboat cost $509.38 at one yard, and the same kind of boat, for the same kind of service, was turned out at another yard for the euphonious sum of $888.80. A 30-foot whaleboat cost

$559.79 at one yard and $740.00 at another. A 14-foot punt cost $63.73 at one yard and $95.12 at another.

In the articles of output for the boats there was found even a greater variation of prices. For the standard 30-foot cutters, one of the yards had made boathooks for fifty cents apiece, while another yard had made exactly the same article at a cost of $3.00 each. Awning stanchions were $1.50 at one yard, and $3.50 at another. Rudders were $6.00 at one yard, and $10.00 at another. A tiller was $1.00 at one yard and $3.00 at another. Oh ye sailors, think of an ordinary boat tiller costing three dollars! Why, a landlubber could buy a lawn mower for that money; and think of the gears, knives, rollers, and other things in the mower. Only the other day, the writer bought, over the retail counter, for his own use, a pick handle. It is a handsome piece of finished work of its kind, made of hickory; it cost twenty cents. Cut in half, and with a little whittling, it would make two fine tillers.

Turning to furniture: A mahogany desk for a cabin cost $136.76 at one yard, while at another, one made for a sister ship cost $190.00, there being no cents wasted on this latter price. An oak desk cost $112.07 at one yard, and $163.30 at another. Toilet racks for officers' rooms, of which there are more than forty made for each battleship, cost $14.60 each at one yard, while at another exactly the same article was turned out for the neat round sum of $20.00.

Each officer's room, on recent ships, is provided with a metal box for storing full-dress uniforms and other valuable clothing that is not in everyday use. The boxes are made after a standard pattern and are perfectly plain. Forty-two of these cases cost at one of the yards $567.00, while at another, a similar number cost $1250.76.

There is a small wooden ditty box provided for each man on board ship, in which to stow odds and ends, such as writing material, sewing gear, letters, etc. They are made after a standard pattern. It cost $1899.17 to make 808 of these boxes at a certain yard, while at another a similar number were completed for the tidy sum of $4259.66.

A chopping block, a simple and prosaic article of ship's equipage, cost $3.00 at one yard and $25.00 at another. A meat block cost $4.00 at one yard and $10.00 at another. An alcohol chest, to hold 75 gallons, cost $71.23 at one yard and $131.61 at another,

while the same kind of chest, but to contain only 50 gallons, cost at one yard $59.22 and at another $120.00. A carpenter's chest cost $18.00 at one yard and $34.00 at another. A lot of deck chests, averaged $18.00 at one yard and $35.00 at another; they were all alike. A turpentine chest, to hold 75 gallons, cost $71.23 at one yard and $131.61 at another.

Made in the Steam Engineering department, a chest for tools cost $33.57 at one yard and $57.44 at another. A chest for kerosene, copper lined, to hold 100 gallons, cost at one yard $89.00 and $142.21 at another. A chest for alcohol driers, containing twelve 5-gallon tins, was made at one yard for what seems the starvation price of $30.32, because, at another yard, the same kind of chest cost $143.03. Several tool chests, for machinists, were made at one yard for $28.10 each, while at another yard it cost $57.28 a piece to turn them out. A copper-lined chest for turpentine cost $95.83 at one yard and $140.25 at another.

At a certain yard it cost $3.16 to manufacture an anvil block, while at another yard the same kind of mechanism was produced at the cost of $11.33. A certain number of plain copper cans, of 30-gallons capacity, for carrying tallow on board ship, cost $10.00 each at one yard and $27.29 at another.

To make and fit into a battleship six galvanized boxes, for fire clay, 30″ x 24″ x 15″, cost at one yard, for the job, $167.01, and at another yard, to make similar boxes, and to fit them on board a sister battleship, it cost $384.12. These same boxes, unfitted, cost at one yard $6.00 each, at another, $8.57, and at still another, $20.84.

The articles quoted are from recent manufacture, and selections have been made from four different yards, all on the Atlantic coast. Green yard has been left out, as little or no equipage is made there. In no case did the expected difference in prices, on account of geographical location, get in sight of the actual differences. And it should be remembered that this difference in the rate of wages affected only the cost of labor entering into the manufacture, and not the material, which is assumed to cost the same at all four yards.

Knowing that navy yard work, even under businesslike administration, cannot be done, with the necessary government methods to contend with, as cheaply as similar work in commercial shops, let us be liberal-minded. Then, also knowing that for every boat

tiller made there are thousands of pick handles and lawn mowers, let us admit that the minimum price of boat tillers made at the yards, one dollar, is a just and proper value. Does this give excuse for manufacturing others at three dollars each? When forty metal stateroom boxes, for officers' uniform, were made at one yard for $567.00, was it good policy to manufacture forty more, at the same time, at another yard not many miles away and with the same resources, at a cost of $1250.76? Where one yard was able to make 808 ditty boxes for $1899.77, was it just to the "Money for the Navy" to spend $4259.66, at the same time, at another yard, in making a similar number? Had there been general inspection from the outside and enforced competition between the yards, it is likely that tillers would not have cost over one dollar anywhere, and that stateroom boxes and ditty boxes would have been turned out at bottom prices. Or, with those regulators in operation, had the expensive yards shown no desire to reduce costs, or an inability to do so, it is improbable that the Department would continue to pay a subsidy to them. No, the more economically managed yards would soon be making all the tillers, stateroom boxes, and ditty boxes, and other things.

In justice to the arguments of this paper, it should be kept in mind that the prices quoted are not the selling prices, as in the cases of the pick handle and the lawn mower; they are not even cost prices. Numerous expenses, such as those connected with the general administration of the yards, purchase of material and yard storehouse handling, which are never added to these navy yard invoice prices, would, were our plant in the hands of the makers of the pick handles or the lawn mowers, go into the price of the boat tillers, etc. We sometimes forget this point. The writer at times has been amused at the way the cost of building ships at our yards and that at private shipyards have been compared. The selling price of the commercially built ship is cooly put alongside the cost price of the navy yard ship without the flutter of an eye lid.

Again the mind is attracted to the subject of the management of the great shops and yard departments of our shore plant. If the flag-officers and battleship commanders are ever selected from the grade below, with the move should go the selection of the "managers" in our shore plant, from the grade below. Even

with a directive system established with which no one man can meddle, success will still depend on the human units—the managers and the bosses. The writer has often seen the efficiency of a yard department go up or down, with change of managers, no other bit of the machinery being touched. Once he saw the onward progress of a yard department reversed so suddenly to the way of wasteful inefficiency that the jar shook the foundations of the whole structure of which that department was a part.

Here is completed another part of this paper upon which particular emphasis is laid, and where thought is requested. With the *supervised* accounts of the different navy yards justly compared yearly to obtain the difference in cost of similar work, what a power for efficiency and economy will have been created. And realize that this power can be invoked at once, without the slightest appeal to Congress. Then it would soon be known who the best men were to manage the shops and foundries; and if we also had the consolidated appropriations advocated, the managers of the single machine shop, the single foundry, etc. could be selected without regard to the corps insignia on their collar, provided there was always common sense shown. But this also is no place for the writer to tarry drawing diagrams for his intelligent friends. It would be unnecessary for an agent of harvesting implements, after demonstrating to a farmer that a particular machine would get his hay in in a tenth the time he was used to, to explain why it was better for the farmer to get his hay in in a shorter time.

Would the changes in the method of appropriating money, and those others suggested here for increasing the economical efficiency of the great shore plant affect the fleet? Yes, materially, perceptibly, absolutely, at once. Every time a navy yard clerk bungles or shirks his work, the fleet *feels* it; every time a navy yard mechanic goes to sleep in the bowels of the hull on which he is working, the fleet *feels* it; every time a supervising authority on shore is overcome by a feeling of laissez faire, the fleet *feels* it; every time two departments at a navy yard waste hours in friction, in bumptious quarreling, the fleet *feels* it. The fleet is as a seismometer, for inefficiency on shore. The shock of the full paid workman idle at his job may not attract ordinary notice, but it is recorded there just the same, and its mark may be deciphered by those who search and weigh and measure.

IV. CONCLUSION.

It is hoped that this paper will not be classed with common criticism. Its mission is far above the gossipy game of fault finding. It treats with a serious question, involving public interests to the extent of millions; for the writer believes, were the changes advocated in this paper made, the saving would reach a high figure. Of course, those in subordinate positions, or in offices where the work is of a strictly technical routine nature and confined to well laid out grooves, should be slow in criticising the system, as a whole, under which they work. For their horizon is necessarily limited; and where the things that dart by their vision, flashing here and there in unexpected places, may seem out of order, or even chaotic, were they to have the extended view of the supervisory power of the whole, they might learn that all those dartings back and forth, across their restricted space, were but parts, sectors of an evenly moving, well organized system. Not so with the criticism in this paper. By the chances of duty, the writer has served long where the horizon of the work extended as far as the technical eye could reach.

This is the time to do great things in the way of bettering government methods of doing business. The spirit is abroad. Even now, faithful little men are working at laying the foundation stones for modern structures of organization in the executive departments, and planning the perfect lines of the above-ground work which will come after; and most of them are doing this without being urged, or without specific direction—for the love of the work, with that enterprising spirit symbolical of the real American. But we are not all thus in the government employ. There is much buncombe within the walls of the government's workshops, whether their output be great papers that use up diplomatic wax and make history for the states of the world, or simply, well, say "packing boxes."

There is a useful trait that might be mentioned here, although it does not seem to have a name in concrete form. Let it be called *mental pluck*. By this is meant daring to think beyond where the last "other" stopped on the same road, or to blaze a new road of thought through the tangled darkness of brush or forest where the unknown or unworked awaits the clearing force of mental activity. All else being equal, the most successful naval officer, or at least the most useful, will be he who has mental pluck.

To the student of great faults in government methods, there seems hardly time for criticism, as they see the new resources almost within touch. There is heard only the call to brawny work to sweep away the inefficient and worthless and begin digging for the solid blocks of the new foundations; to sweep off the old shacks of patchwork designed by the lazy man, or by ignorance, or, perhaps, by political greed, and put in their place the beautiful work-buildings of system and public economy. Every stone and every beam will be determined in advance, and there will be no more or less than the required strength. The new structures will be fitted from the base up, and no foundation stone will be placed where it may afterwards sink when weight above is applied. There will be no place for those wonderful workmen who first build the elaborate roof of their structure, hang it to the clouds, and then work easily to earth.

Yes, a war has been begun against the arch enemy of economical public work. He is General Waste. There have been only skirmishes so far, wiping out little outposts of the General here and there; but the torch of conflict is now lighted, not to be quenched until the General and all of his soldiers from politics and lazy-land are out of combat.

In a paper by Mr. John Whitmore, in the Journal of Accountancy, for January, 1907, appears the following:

"For there is no waste but falls under some one's eye, and no difficulty but some one knows of it, and probably there is no man but sees something which others fails to see. It needs only wise organization to open this great field of advantageous working together to all who are engaged in productive operations. Wise organization would include provision for measuring values. . . . .

"There is in all productive operations a law of increasing and decreasing return whose workings are only followed by means of constant and patient analysis. When such analysis is applied to the complexities of modern manufacture, innumerable losses are found constantly eating into the profits made. When the problem of eliminating such losses is considered it is plainly seen that the essential need is the organizing of every resource of brain and active interest, and the constant building up and co-ordinating of every human efficiency."

This fits in with what has gone before. It reiterates the principle that there can never be sound economy where there is not sound organization. The writer would have the last sentence of this quotation done in illuminated letters and hung in every bureau and yard department office.

Government work has a force entering into it that is not found in commercial life, necessarily, and that is PATRIOTISM. Pride may be a force in commercial work, but we have that also in government work. In addition, and above that, is patriotism. Any part of the naval organization that can be swerved either to the right or left, out of the logical path towards economical efficiency, under the influence of political blandishment or terrorism should not be tolerated by even the humble workers. The deadliest poison that an administrative officer in the navy can imbibe into his official system is the game of politics as related to the navy. The moment he begins to play the game, no matter what the stake may be—supplies, new buildings, self-prominence, or what not—the economical efficiency of the service, to the extent of that officer's power as part of the machinery of the organization, begins to suffer. And no matter who the politician may be, when he takes a personal, familiar hand in naval affairs, beyond the barriers of official duty, through the above mentioned power of blandishment or terrorism, he increases the "costs." The intercourse between Congress and the navy should be formally official, and never, under any circumstances, familiar.

Enough. But let it be understood that we are advancing all the time in the right direction. With the axe of common sense, the lever of intelligent application, and the fulcrum of truth, we are clearing the stumps and the decaying trees from our field of endeavor, that we may sew for a crop that will be called *perfect economical efficiency;* that each shining golden Eagle passed out to us for the support of the navy, will go forth from our hands without the dirty smudge of slothfulness upon it, without the indent of the fingernails of cupidity marring its coined beauty; and that, at the end of all accounting, each year, in the Nation's cash book, the amount of the naval appropriation bill may truly be written off "By value received."

DISCUSSION.

Lieut.-Commander A. B. HOFF, U. S. Navy.—This third of the series of brilliant articles by Pay Inspector Mudd entirely maintains the high standard of keen research and keener humor which the service has become fully justified in expecting from his pen.

The value of a critical article, however, depends, first on the soundness of the criticism, and second, on the efficacy of the cure.

Let us examine these first under general heads, and then in detail.

A. Criticism.—Annual appropriation bills are unnecessarily involved,

and embrace under different bureaus items which could be appropriated in the lump and then distributed.

Cure.—Appropriate all moneys under general heads and sub-heads (as indicated). Money to be allotted to the bureaus by the Secretary (that is to say by the paymaster-general).

B. Criticism.—Estimates for appropriations are difficult of dissection.

Cure.—A card system of circles in each bureau, by which each separate item is easily accounted for to the Naval Committee.

The above may be termed "accountant" diseases and "accountant" remedies.

C. Criticism.—Involved and indeterminate accounts of yard departments cause unnecessary waste.

Cure.—Indeterminate. Inspection by Bureau of Supplies and Accounts vaguely suggested.

D. Criticism.—Manufacture, repair, and construction work at different yards, and at same yard at different times, costs differently.

Cure.—Indeterminate. Inspection by Bureau of Supplies and Accounts vaguely suggested.

Criticism "C" I believe to be incorrect. Criticism "D" I consider a natural condition. They are, in any event, details of technical administration, which it is difficult to see that an accountant expert is fitted by training either to correct or cope with.

From my small experience in a navy yard as equipment and ordnance officer, I believe that there is too much "accountant branch" mixed in with technical work. I feel certain that most navy yard officers will corroborate this as to efficiency, and I think a thorough investigation will show that there is little, if any, economy gained by it. Figures prove anything, when handled in the right way, and without further investigation.

Let us examine in detail "A," "B," "C," and "D." The system of estimates ("B") seems to me a capital and thoroughly practical idea.

There could also be *some* consolidation of shops with good results.

As regards the essayist's plaint about "interference of trades," some of his strictures are more imaginary than real. Some are actual. Cases like the "Tale of the Commandant's Typewriter" (p. 65 top), and like that of the "Ambitious General Storekeeper" (p. 65 bottom), should and could easily be corrected by each bureau controlling the appropriation for its own offices and administration.

The commandant's office should, of course, not be under yard and docks, as that bureau is at present constituted.

On the other hand, the remarks about C. & R. controlling the spit kids and easy chairs, although technically correct, are certainly misleading. Such allowances—in all bureaus—are practically controlled by the people who use these things, although furnished from the bureau's funds. This system, with probably fewer exceptions than any other, works well and to the satisfaction of the majority. Why change it *in toto?* Some one has to provide these things. Who shall it be then? The essayist offers no suggestions.

And now for "A," the Appropriation Bill. The accretions of time have certainly produced a queer mixture, and the clear reasoning of the essay-

ist for a suitable simplification should be seconded by every one who is in a position to do so with effect.

But, "The healthy pride of each bureau must be scrupulously respected if there is to be sound administration."

If this is so (and we have the author's own word for it) it indicates that the appropriation of money in the lump, and distribution by the paymaster-general, would be one of the least desirable conditions that could possibly be thrust upon the administration of the whole navy.

Under conditions as they actually exist it is absolutely necessary that a bureau shall know in advance what money it has to spend. This is obvious.

Appropriations in the lump, to be divided by the paymaster-general, acting under the Secretary's orders, would cause no end of troubles, beside furnishing jobs for twenty more clerks and paymasters, and doubling each bureau's accountant work.

We would then have interference of trades with a vengenance—the trade of accountant interfering with, and passing upon every necessity for, all the other trades.

A little thing like the "Tale of the Ambitious General Storekeeper and the Motor Truck" would then pale into the insignificance of a minor detail of everyday occurrence.

Then higher than all this is the fact that Congress wants to know exactly *what* they are giving to *who?* Under the new system of estimates proposed this ought to be easy.

So much for the "accountant diseases" criticized.

We now have the "technical diseases (if they exist), for which no real cure is suggested.

Let us take up "C" first. Page 68 we have "What shows that all the expenditure of value was *necessary* for maintaining the navy in that state of efficiency prescribed by those in supreme control, or for the results obtained? Nothing."

This may be true with regard to the Bureau of Supplies and Accounts. I am unable to state in regard to them. But in Equipment and Ordnance, and I am assured it is the same in the other yard departments, the *head of each department* is responsible that the expenditure is necessary.

I fail to see exactly where the expert accountant could help in this case. Could *he* show that the expenditure was or was not necessary?

The report of the paymaster-general for 1899, quoted by the essayist, evidently thinks so. It is only natural, however, for each one to think his own good men are the panacea for all evils we find in this united effort toward the mutual good.

However that was '99—nine years ago. In this year of grace, 1908, I can say the yard accounts are fairly simple and show fully and accurately, both to their own bureaus and to Supplies and Accounts, every cent spent for material and labor.

Space forbids my explaining any one of these systems in detail. Each bureau differs slightly. In fact before this got to press there might be a new change.

The *necessity* for each expenditure is certified to by the head of department. Now about all that is left of the matter is the running of the

actual job. Is the "accountant inspector" going to tell you whether ten men are too many on a boiler job? Or whether your amounts of material are excessive in the making of a switch-board?

I fear the Admirable Crichton has yet to be born, with the breadth of view and depth of attainments capable of handling the five yard departments in this manner. Yet that is what I infer to be suggested as the duty of the "accountant inspector."

Let us have inspection by all means. But let it be by people that by reason of experience and training are capable of such inspection.

A rational scheme, which I believe would be of great benefit, would be to have a navy yard inspector in each bureau. Methods of work would then improve and be standardized, special conditions would be known more clearly at each bureau, greater economy would develop, and, what is greatest, *efficiency*, would be advanced in no small degree.

Certainly no accountant inspector could do this.

D. Cost of work at different yards:

First (p. 75), in showing daily wage of labor in different yards, the locality, which governs the price of labor, is entirely ignored. As this is the whole crux of the matter, as every Board on Wages knows, the results deduced from such a premise can also be ignored.

Next, the essayist starts with a premise that a logical basis of comparison of work in different yards is "cost per pound of output," using figures for only one year.

As yards vary in size, character of work performed, locality as regards both material and labor, and, moreover, have a yearly variance in each of these, it can hardly be admitted that this either is a logical basis of comparison. Possibly if this comparison were extended to *ten* years, and all the yards did steady work of the same general character during that period, some such comparison might be made. But these conditions do not occur.

Now, as regards the different cost of similar work at the same and different yards, the explanation of this mystery is so simple that one is forced to believe that the essayist is unaware of the conditions governing the cost of manufactured articles. It is certainly not an evil—calling for the "accountant cure." I will endeavor to throw some light.

Cost of production depends on (A) labor; (B) material.

Material may be a specially expensive lot (which you are forced to draw,—no choice in the matter at all!); or something cheaper from a larger "block of stock." Or you may be able to work in some scrap one time and not another; or there may be some old parts on hand you can use.

Labor is what is given to you. If it is poor, the burden of proof rests on you to prove it. The labor in a job may be all machine, all hand, or a mixture of the two, in all manner of proportions. The workmen vary in age, price, and ability; the foremen vary in ability; the heads of departments vary in ability.

Some heads of departments may be particularly keen in reducing the price of one particular thing, and their successors have a different hobby. Also the nearness of shops to other shops, to ships, to docks, and wharves, all come in to this "mystery" of difference in cost. The numerical quantity

in the order for manufacture, or repairs, and the pressure of work, all affect this matter. No two conditions are alike. I fear I am a sceptic as to the practicability of the "accountant cure" being applied to this.

For example, in the C. & R. Department, here at Portsmouth, the cost of certain articles has been reduced as follows within the past two or three years:

Camp chairs	$4.15	to	$2.10
Camp stools	1.75	"	.49
Ditty boxes	4.50	"	2.80

This reduction was effected entirely by having these articles ordered in large enough quantities to pay for the introduction of special jigs and other labor-saving machinery.

The price of cooperage in the same manner has been reduced as follows:

Spit boxes	$3.54	to	$ .85
Deck buckets	3.97	"	.85
18-gal. breakers	14.11	"	3.75

Probably different conditions in these items obtain at all other yards.

To show the enormous difference in price between articles that have to be specially made to meet a sudden requisition, and those that are made in quantities, we will take the case of boat-hook handles. An order for seven of these handles to supply a ship's requisition, the stock being exhausted, cost $1.34 each. In lots of one thousand these are made for 25 cents apiece. Very likely the essayist's 20-cent pick-handle was the result of some such "mysterious method" as being made in lots of ten thousand. Hence it will be seen that the mere comparison of prices for the same article would be very misleading unless the conditions are understood. When understood, it is A B C to anyone.

The essayist makes a very particular point of the cost of boats. A very considerable part of the cost of a boat is the metal work.

If castings are made for a single boat the price is far and away higher than if the metal work is drawn out, having been made in large lots and stored.

In conclusion, I beg the essayist to believe that I have taken issue with him thus flatly on so many of his points, only because I consider it is due the service to avoid misconceptions, or what I conceive to be such; and that these, naturally, occupy my space, to the exclusion of dilating upon the many excellencies that I, personally, find to admire in this more than interesting essay.

I believe there is natural waste, and I believe there is avoidable waste. Some waste can be avoided and I have suggested "bureau inspection" as a means to this end. I have endeavored to show that I cannot conceive that the regulating, of such a vast enterprise as navy yard administration, is an accountant's job. A thorough inquiry into such matters by the department will, I believe, bring forth much good, and possibly some changes.

It must always be borne in mind that naval administration at navy yards is not primarily a money-making concern.

Hence, wheel-clogging economy, with its dilatory methods, is not always efficiency. Elasticity is as necessary. For the only reason a navy exists is to be ready, hourly,—to fight.

WAR ON THE SEA

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STRATEGY AND TACTICS

BY

Gabriel DARRIEUS

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Basic Principles

Experience is the sole test of truth

TRANSLATED BY PHILIP R. ALGER, PROFESSOR, U. S. N.

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WAR ON THE SEA.[1]

By CAPTAIN GABRIEL DARRIEUS, French Navy,
Translated by PHILIP R. ALGER, Professor, U. S. Navy.

INTRODUCTION.

Yielding to the friendly solicitations of a very large number of my comrades of all grades in the navy, I have decided to publish the substance of the general ideas which I have already set forth at the Naval War College.

Furthermore, it seemed to me to be a propitious time to make at least one seaman's voice heard, in the passionate debate now going on about the principles of naval warfare. It is curious, indeed, to note that officers are vainly to be sought among the many spokesmen of the two opposing parties, which are daily strengthened by new recruits and sit in judgment on a technical question of vital concern to the nation.

Unless it can be shown that naval men are incompetent to discuss their own profession, we cannot admit that they alone should remain silent in regard to the principles which ought to govern the constitution of the fleet.

There is much to be done in France in the way of freeing the voices and pens of naval officers from the strict rules which limit them in the great field of discussion of naval affairs. The English government sets us a very good example in this respect, as it always does where naval matters are concerned. At the very moment when, a few years ago, we gave to certain officers, with extreme parsimony and under many restrictions, authority to hold conferences in the name of the Naval League, Admiral Charles Beresford was uttering loud protests and complaints on professional subjects in the journals and at public meetings without any attempt on the part of the Admiralty to interfere in the slightest degree with his freedom of speech.

Such an attitude is justified by the importance which the British Admiralty has always attached to the education of public

[1] The remainder of this work will appear in succeeding numbers of the PROCEEDINGS and will be issued in book form.

opinion in regard to all maritime questions, and also by the very clear perception that the ideas expressed by an officer, however eminent, commit no one but himself, and have only the exact value which people are willing to give to them.

There is no doubt that we must attribute to the fixed rule of silence, imposed even now upon our experts, the unfortunate fact that, in our country alone, first principles are constantly being questioned and the same sterile discussions are periodically renewed.

Our lack of method is the only possible explanation of the fact that the plainest teachings of recent naval wars are interpreted in France differently from anywhere else, and often in a manner contrary to common sense.

And perhaps some of the blame must be placed upon the navy itself, on account of its confused ideas about maritime questions, its mental disunion, and, to sum all, its absolute lack of a body of doctrine in regard to naval warfare.

Only a few years ago it was a common saying that "As many naval officers, so many different opinions on any professional subject." Very recently, relative to a definite establishment of the Torpedo School, two reports, made at short intervals to explain requests for funds, each contained a phrase intended to lay down a principle of fundamental importance. "*The School must be on board ship*" said one; and the other, a few months later, "*The School must be on shore.*"

This real professional anarchy, which alienated much of the sympathy naturally belonging to the navy, was due to two principal causes: in the first place, naval material has been so radically transformed during the last fifty years that in no other industrial development has there been such an overturning; in the second place, there has been a total absence of instruction in the art of modern war. Actually, we may consider these two causes to be but one. Naval constructions have been altered with feverish haste to keep pace with industrial progress, before the diverse conceptions upon which they were built, out of fashion ere used, could find justification in the essential basis of truth, *experience.*

From the beginning of modern fleets to Tsushima there had been few or no naval battles worthy of the name. In the study here undertaken, leaving out of account the Russo-Japanese war, we shall be able to develop some special facts, but for our con-

clusions we shall have to depend at least as much upon logical reasoning and common sense as upon experimenal data.

This explains and to some extent justifies the lack of clearness of naval ideas—what this was scarcely ten years ago can best be imagined by recalling the mental state of those in command of our army before 1870. The same lack of a theory of war; the same misunderstanding of the exigencies of modern war material and of the management of large forces of men; the same blind and fatal faith in the disentanglement of affairs on the battle field.

To show that I state nothing not rigorously true, it will suffice to recall that but a few years ago our signal books were encumbered with chapters relating to the manœuvers of fleets under sail, when masts had long been discarded. At a date also recent, provision was made at general quarters for calling away boarders, and I am not sure but what exercises are still carried on upon some of our ships to meet this quite impossible contingency.

Our disasters in 1870 have at least taught us the worth of long and patient preparation for war; that, wanting the genius of a Napoleon, the untiring work of a Moltke, based on reason and method and leaving nothing to chance, can lead to victory. The army has profited by the lesson of that terrible year, to the great good of our country: would it really be too much to hope that the navy may obtain as favorable a result without a naval Sedan?

That same Moltke said, towards the end of his life, "*Our campaigns and our victories have instructed the French, who like us, have numbers, armament and courage. Our strength will be in management, in leadership, in one word in the General Staff. This strength France may envy us, she does not possess it.*"

The creation of the Naval War College was the first step towards a general staff, as necessary in the preparation for naval war as in that for a war on land, and which must be realized some day, when minds are better prepared for it, after several generations of officers have passed through the college.

The most pressing need, as a matter of fact, is to co-ordinate ideas, to examine rigorously all the various opinions current in regard to naval affairs, and to retain the very small number of facts which can be admitted to be true, to serve as the basis of a doctrine which the future and a better established teaching should little by little enrich. Thus we can each contribute to the common work which, growing little by little, will in the near future be so

mighty as to overcome all opposition and destroy even the memory of the obscurities of the past.

To make every one perceive as strongly as I do the necessity for this great work of unifying professional ideas in our navy and making them precise, it will be enough to cite a single instance.

At the beginning of 1898, the Superior Naval Council, come together to draw up a shipbuilding program, decided that France needed, besides battleships, a fleet of twelve armored cruisers. Why twelve? The minutes of the meeting are silent as to the reasons for this conclusion. Some months, I might even say some weeks later, at a new meeting of the Council, held for quite another purpose, a member observed that the number of armored cruisers formerly voted seemed to him insufficient, especially in view of the exigencies of our colonial policy, and he proposed to increase the number to twenty-four. After a confused discussion, the Council pronounced for eighteen. No serious argument was advanced for that number any more than for the others.

Although I have not yet touched upon even the most elementary notions of strategy and tactics, which are to be the subjects of my work, it must be apparent that questions of warfare should not be settled by sentiment. And let it here be said, once for all, that there is no question of persons. Men are nothing, ideas alone concern us.

This example shows better than any argument how much we lacked even elementary knowledge of naval affairs only a few years ago. Among the complex problems to which the idea of strategy gives rise, there is none more important than that of the constitution of a fleet, and it goes without saying that every project which takes account neither of the foreign relations of a great nation nor of the material limit fixed by its resources, of necessity rests upon a weak and unstable base.

The end and aim of the War College, as well as of this work, is to build up a military system upon solid and enduring foundations. Surely to attain this result, a lofty aim is necessary; moreover, to repeat a happy phrase used elsewhere, I shall take care to exclude from the subjects treated everything which does not have war for its object. It was in obedience to this precise thought that the founder of the college, M. E. Lockroy, the Minister of 1895-1896, gave it the name of Naval *War* College. He wished thus to indicate the primary importance which he attached to making the

great and fruitful concept of war the ever guiding star of his labors.

Whatever may be the interest attaching to the different problems raised by naval questions, the aggregation of which gives to the naval organization its complex character, I utter only the exact truth when I affirm that those of strategy and of naval tactics are its master key and best express its essence. We can foresee that still far off moment when, by an at last realized general agreement of ideas, all other problems will lend themselves to the solution of this fundamental problem of the military art. It is that which will form the strong roots by which the general growth will be nourished.

And, first, let it be well understood that there can be no question of defining by rules the means of obtaining victory. I fully agree with Commander Rouyer's words, "*Victory is not taught, any more than genius is acquired by study.*"

But, by resting satisfied with this somewhat deceptive truth—and far too long we have been content to accept it as an excuse for culpable negligence and detestable lack of energy—a people hypnotized into expecting the providential appearance of a saving genius runs the risk of being almost certainly haled to defeat. Genius is not needed to prepare for war; to concentrate the national forces; to provide, in time of peace, arms, ships, personnel, the necessary stores; in a word, to study, without leaving anything to chance, how best to use these resources so that at the hour of danger, and at the point of danger, there shall be the greatest number of favorable chances. If, other things being equal, a great military leader then appears, he will be welcome, but he will be so much the more sure of victory as, in the matter of improvisations, none are demanded of him but those of the battle itself.

The present work has for its object the exposition of the rational general method which should guide us in preparing for war. And, in the first place, what signification should we give to the words strategy and tactics?

If one considers their etymologies, the Greek word στρατεια means "military expedition," "campaign"; from στρατηγια, "ruse de guerre," a French word having the same meaning has been made, "stratagème," and this corresponds to the intuitive idea which we attach to the word strategy. Τακτικὴ, tactics, is derived from τακτικὸς, "regulated," "regular," that which re-

lates to regulated movements, to manœuvers on the field of battle. Τακτικοὶ ἀριθμοὶ, regular lines of battle (Xenophon).

In fact, and without arguing from examples in the animal kingdom, where "ruses de guerre" are the general rule, the ideas of strategy and of tactics are as old as humanity itself.

From the day when two men of unequal muscular strength engaged in a struggle to settle their quarrel, arms were invented. To compensate for his natural inferiority, the weaker naturally seized a weapon, the first thing to hand, a stone, the branch of a tree, and that not being enough to re-establish an equality of force, he has been obliged to surprise the secret weaknesses of his adversary; to endeavor to attack him at the moment most unfavorable for him, in a word, to use stratagem with him.

If, with the constant progress of human industry, the material conditions of strife have changed, causes and principles have remained the same. And, when one examines the facts to discover their philosophy, it appears that the continued improvements in war material throughout the ages have had no other origin and no other motive than the natural desire of the weak to sustain himself against the degrading and odious tyranny of brute strength.

There is no general agreement as to the line of demarcation between the two fundamental divisions of the military art. Where does strategy end, and where begins tactics?

In the 1892-1893 conferences at the Army War College, General Bonnal called attention to the definitions, unlike in words rather than in sense, adopted by military writers of authority in such matters. Napoleon never used the word strategy; sometimes he used the expression *grand tactics*, sometimes the term *higher branches of war*.

Clausevitz defined strategy as *the use of battle in war;* tactics as *the use of troops in battle.*

For Jomini, strategy includes all that goes on in the theater of war, while tactics is the art of fighting on a field of battle.

According to Moltke, *strategy shows the best way leading to the battle; it tells* WHERE *and* WHEN *one ought to fight. Tactics teaches how to use the different arms in fighting; it tells* HOW *one ought to fight.*

General Bonnal summed up these different views in the following excellent definitions: *Strategy is the art of conceiving; tactics is the science of executing.*

If thus far we have considered only definitions relating to the manœuvers of armies, there is hardly need to point out that they apply equally well to the operations of fleets. The terms of strategy and tactics are connected with abstract ideas, true whatever may be the means of execution.

Thus Mahan, in agreement with most military writers, fixed the line of separation between strategy and tactics at the point where the two hostile forces come into *contact*. But it must be clearly understood that the expression "contact" is not to be taken literally, implying within sight, at short distance, etc. There is really contact between two hostile warlike forces when they know each other's positions with such exactness that their encounter, the final object of the war, is unavoidable.

I shall not linger over discussions of words, and if I have thought it well to recall the various opinions on this subject, it is because it is above all important to thoroughly understand each other.

Adopting from now on language as concise and exact as possible, and remembering that in the main the etymology of the words expresses their sense, the word *strategy* henceforth will convey the idea of *preparation* for fighting, and the word *tactics* that of the *execution* of the fighting.

I shall begin with the study of strategy: if I have succeeded in well expressing my thoughts, in the matter of definitions, it will at once be apparent that this will form the most important part of the work. The tragic facts of real life, to which we shall refer in detail further on, show us that if the wisest tactical combinations of the battle field can be destroyed or crowned with success in a few hours, if that success is most often dependent upon the spontaneous inspirations of a leader, the strategical preparation for war cannot be improvised. It is the fruit of long and patient meditations, of far sighted measures taken long in advance and requiring slow but unbroken effort through many years.

In fact, strategy touches upon all the problems of war; it is their very soul; its field of action is unlimited, and many volumes could be devoted to it without coming near to exhausting the subject.

Before examining in detail, in a book intended for publication, all the points which strategy bears upon, I quite naturally put to myself the question: *How ought one to conceive the strategy of*

modern fleets? For a reply, I remembered those words of an illustrious philosopher, Taine, in his admirable work on the Origins of Contemporary France: *"What is Contemporary France? To reply to this question, it is necessary to know how this France arose, or, what is better, to assist as a spectator at its formation."*

It is just so of strategy, as well as of general tactics; these two foundations of the military art being as old as the world, if we wish to understand their actual requirements, it is impossible to leave out of consideration their past, their evolution through the ages, and their adaptation to incessantly changing weapons.

This study is so much the more necessary in France, and particularly in the French navy, because, as we have already seen, in the absence of any continuity of action and of clear sighted direction, our preparation for war has most often been the work of pure chance.

It is to the teachings of history, then, that I shall have recourse in beginning the study of strategy. This method is legitimate, for it is reasonable to suppose that, besides their flashes of genius, the great captains of all times have owed their victories to some general rules, some wise dispositions, which we may well hope to be able to apply to modern wars.

Understand once again that it is not at all my idea to develop a code, consisting of a certain number of precise rules, by the strict application of which upon the field of battle victory may be surely won. My aim is more modest and not less useful; it is to seek in the past some general indications capable of guiding a great leader, *other things being equal,* to success.

Those who are able to perceive all the profit which may be derived from the study of the history of great wars will have a well founded confidence in the success of this endeavor.

"The value of troops actually depends more upon the value of their chiefs than it used to," writes Von der Goltz. And he adds: *"It is not only important to inquire what qualities a man must have to do great things, as a commander-in-chief, but it is needful also to inquire what the conditions surrounding the army and the military organization must be in order that it may be possible for great war leaders to appear."*

To decide what these conditions are, we must go back to the beginnings, to the very sources of military history.

"The principles of war," said Napoleon, *"are those which have*

guided the great captains of whom history has handed down to us the high deeds." And did he not also write, "*Knowledge of the higher branches of war is only to be acquired by experience and by the study of the history of the wars and battles of great captains.*"

Are not the important works of Clausewitz and of Jomini wholly based upon the study of the great Napoleonic drama?

The latter military writer expressed himself as follows: "*In great strategic operations, as well as in great battle combinations, victory would result to-day, as it always has resulted, from the application of the principles which led to success the great captains of all times, Alexander or Cæsar, Frederick or Napoleon.*"

Similarly, referring more particularly to naval affairs, Mahan says: "*There is a substantial agreement among professional writers that, while many of the conditions of war vary from age to age with the progress of weapons, there are certain teachings in the school of history which remain constant, and being, therefore, of universal application, can be elevated to the rank of general principles.*"

Without for an instant losing sight of our higher aim, which is and always will be *war*, we shall seek in history for the ensemble of those general principles of the military art to which the writers cited above allude. After a hasty sketch of the military campaigns of Alexander, Hannibal, Cæsar and Napoleon, we shall look for guidance more particularly in maritime wars. Those of the American Revolution and of the first Empire, on account of the great seamen who made them illustrious, will in the first place engage our attention. In modern times, the War of the Rebellion, that of Italy in which Lissa took place, the Chili-Peruvian wars, Admiral Courbet's campaign, the China-Japan conflict, and that between Spain and the United States, will furnish material for very interesting conclusions, because the material used in these successive wars comes much nearer to what is now used than that of older times. Finally, after this rapid view, we shall devote an entire chapter to the Russo-Japanese war, not so much because of its actual events, as on account of the valuable lessons of all sorts that it furnishes. Imperfectly known as it still is, at least in details, its general character is already sufficiently well outlined to enable us to state that very few among the wars of the past can furnish a more ample harvest of lessons to be pondered. And when I speak of profitable lessons, I am not thinking of models

to be followed, but much rather of accumulated errors which it would be well for us to be able to avoid committing in our turn.

May we, above all we of the French navy, be able to draw profit from the faults of all sorts committed by Russia! And it is because this war, a veritable lesson in affairs, offers us instruction in strategy and tactics by practical examples, that I give to it a special importance.

To prevent this study of the past from remaining sterile, we must sum up the conclusions at which we gradually arrive, and provide ourselves as it were with a compact vade mecum of the small number of doctrines which the sequence of events shall not have invalidated.

Then will begin our much more difficult task, as well as most interesting; to apply the teachings of the past to actual navies, and especially to the French navy. And I feel so much the importance of this problem that I would not have hesitated to attack it in the first chapter, if I had not been fully convinced that thus treated, and without previous knowledge of derivations, this study would have been too artificial. If the satisfaction felt in it is postponed for a few short chapters, the results will be the better.

But from the moment that the problem of war, thus far abstractly viewed, resolves itself into a concrete case, that of the French navy for example, the mind necessarily reverts to given facts which seem to have a prejudicial character. Common sense and reason indicate that a given nation, a given navy, ought to foresee, to prepare its forces in view of well determined aims. The general problem of war admits only of a series of solutions applicable to well defined concrete cases rather than a single solution good for all possible conflicts. It is evident that, between the extreme cases where the adversaries are respectively an exclusively naval power and another having only land forces, there is room for all the combinations of the preparation for naval war.

Thus is revealed the clear conception of the necessity of a foreign policy which shall be the inspiring cause of strategy, and, actually, the latter, with the operations which it entails, is so closely tied to the former that it is not possible to sketch the least plan of war without a perfect knowledge of political objectives, of ends pursued, of possible alliances, etc.; the field is immense.

And it is precisely because the field is so vast, that strategy must

have an initial point of departure and a final end, that there is an imperative moral obligation upon those in power to point them out.

It would be superfluous to insist upon the fact that, being in no way the recipient of such confidences, I shall be unable to indicate with precision the point of departure and that of arrival of French foreign policy. As we must nevertheless reason about concrete examples, we shall be forced to make hypotheses. And in order to give the maximum likelihood to the choice of these examples, I shall devote a chapter to the discussion of the political situation of France, first as related to what we may call her traditional enemies, by reason of the numerous wars or quarrels with them throughout the past, like England and Germany, and then as related to new nations, active and restless, whose desires of all kinds are becoming disquieting, the United States, Japan, etc. Nor shall we forget, among the prime causes of war, the bitter commercial strife in which all civilized nations are now engaged for the conquest of the world's trade, and the pacific appearance of which masks a threatening future.

It is chiefly when thinking of this chapter of the book that I feel my total incompetence; much time, and above all more ability than I possess, would be required to succeed in convincing all Frenchmen, and especially officers, that the two terms, foreign policy and strategy, are bound together by an indestructible link.

However weak and hypothetical may be the ideas that I shall develop, they will at least have the advantage of furnishing a solid ground for discussion, allowing a precise demonstration of how the objectives of a war are connected with the projects of the government. I shall have shown the method, and that will do for the moment.

The first question that suggests itself is evidently that of the tool to be used, that is to say of the fighting fleet which best corresponds to the chosen and definitely adopted policy. It is moreover clear that this problem of the constitution of the fighting fleet, the most important of all which are raised by the study of preparation for war, allows of an infinity of solutions, among which two different nations will chose according to their needs or their special tastes.

We are concerned, then, with a study than which there is none more serious or more profound, and the combined efforts of all the people of a country would not be too much properly to conduct it.

In the first place, and before any other inquiry, it is essential to determine the conditions which should be fulfilled by the different arms which the developments of modern industries place at the seaman's disposal.

On this subject, I recall a remark, which I noted as particularly suggestive, among the numerous questions asked of me, regarding my way of understanding a study of strategy. "*You will evidently not have to concern yourself with ordnance.*" was said to me incidentally. I confess that this proposition quite struck me dumb. Who then whould be concerned about ordnance, if not the writer who proposes to elucidate for naval officers the requirements of strategy and of tactics?

The art of preparation for war does not consist solely of putting to work and utilizing existing military resources; one of its branches, and not the least, consists of a complete study of future resources, which measure up to military needs in proportion as we exert ourselves to meet them.

Who then should be qualified to set the problem, if not the office charged with this preparation for war, the one which we at once think of in connection with the idea of strategy and tactics, the General Staff?

I am aware that a certain school, having quite a large number of adherents in France, conceives of the directing military authority as an assemblage of little groups, independent of one another, each charged with a fraction of the military task, but without any unifying principle to co-ordinate the fractions and give life to the whole. If this conception pleases so many minds, enamored of individualism, it is because they see in it an ideal sort of classification, each question thoroughly and separately considered, by a special office, with no other thought than the constant perfecting of each arm or each tool, and then, as it were, methodically catalogued in an always open index.

This bureaucratic idea is not mine, because the cultivation of general ideas, which alone are fruitful and vivifying, is wanting to it; but the question is a higher one. Does it respond exactly and faithfully to the set military problem? And, turning to the constructor, I ask of him: *Have you been furnished with the list of requirements which must be satisfied?* And going further: "*Have you demanded it of the sole directing office, qualified to furnish it? If this has not been done, then the solution of the*

problem is bad, whatever may be the skill and ingenuity of your work as a specialist."

What I say of ordnance applies equally to torpedoes and the constructor's work.

The only reasonable and logical organization is one which is modeled upon the processes of nature; in the study of living organizations, it is very quickly seen that while they are provided with acting members, they have above all a brain of which the function of command and impulse is so essential that without it equilibrium could not possibly exist and for an harmonious adjustment of forces there would be substituted an impotent anarchy.

The classic experiment in physiology is well known, of the pigeon from which the cerebral hemispheres have been removed; the animal eats, drinks, walks, flies, performs separately each of its separate functions, by reflex action; there is no doubt that this is not death, but it is very far from life in the whole sense of the word.

It is from the absence of this directing and impelling organ that the navy really suffers, and has suffered for too long a time, and it is because every study of strategy and tactics ought to constantly have *war* in mind, that the need of a general staff must be here urged.

It is well from time to time to examine our consciences, and in looking back over the last thirty years, we can say with all sincerity it is our very own fault that the French navy has been given a "patchwork" fleet; it is also and always our fault that we have so many ships without military value, without counting all our other mistakes.

The eminent engineers who have charge of the construction of our ships, and whose scientific knowledge fully equals that of their foreign colleagues, would have given us, I am sure, magnificent implements of war, if we had put our problems before them otherwise than in indefinite terms, most frequently contradictory, and in words whose vagueness often concealed lack of sense.

It is full time to break with this school of irresponsibility, and if I have called attention, once more, to the object of a higher teaching of war in the navy, it is to justify the introduction into every program of strategy and tactics the study of weapons.

That this primary rôle of directing should be vested in our corps is natural, it is the consequence of our profession, which is

war; moreover it requires but little reflection to see that while we may very well conceive of a navy without engineers, constructors, mechanicians or paymasters, we cannot imagine one without line officers.

Let us then henceforth resolutely assume all the responsibility; the lesson will bear fruit. If we begin hesitatingly, at least we will safeguard the principle, and we shall be able to blame none but ourselves for the result. Younger and abler men will follow in our path, who will have all the authority necessary, aided by the beneficent effect of the doctrines and the tradition drawn from these patient studies of war.

And there are still other thoughts which have led me to chose the form under which I present my book, so necessary has it seemed to me to show the close connection between the constitution of a projected fleet and the initial military conception.

The study of weapons, of the gun, the torpedo, the ram, etc., not going at all into details of their manufacture or mechanism, is a necessary part of the art of war. It is important to ascertain what conditions these weapons must satisfy with a view to their use in fighting; the improvements which we *greatly wish* them to have and the circumstances which favor their use. And it is apparent that any study of this kind would be purely speculative if it did not take account of what other nations are doing and particularly of what sort of hostile ships these weapons are to be used against.

These same weapons are carried by the fighting ship, a mobile gun platform, the determination of whose characteristics is one of the most important problems that exists; there are none which, in France, have had such fantastic and various solutions. Its powerful interest, as well as the anxious wish to find the unity which best suits the needs of French naval policy justify the laborious attention which should be given to it.

When we endeavor to solve the particular, much disputed, question of armor, of the protection of the vital parts of the ship and the most reasonable distribution of the weight allotted to that protection, what we must definitely ask military ideas and exigencies to fix for us, and they alone can do so, is the right balance between the conflicting elements of the complex design of the fighting ship. And the same is true as regards speed and other qualities.

However perfect we may suppose a fighting unit, it has no

raison d'être, nor even any practical value, unless other similar units exist; hence proceeds the idea of naval forces. A nation's fleets are the realization of its naval policy; and at once there again appears the close bond between the execution of a naval program and the foreign policy of a country.

At every step in the logical developments of strategy we meet new affirmations of the necessity of definite problems, connected together naturally and in sequence, in a perfect harmony of conceptions and thoughts. The political problem, having received a precise and clear solution on the part of the governmental authorities, allows strategy, represented by the General Staff, in its turn to clearly define, without any obscurity of principle, the military problem, with all its data. The constructor can then go on, without groping in the dark, and furnish, without appeal, a practical solution, in the responsibility for which each competent authority will have his definite share. Any other method, and to this day the one I point out has been systematically disregarded in France, can only lead to anarchy and to strategic and tactical disorder.

There is scarcely need to say that I shall have to formulate my own hypotheses, since I am not in any way in possession of the government's thoughts. But that matters little, since the essential is to study a method, and this study involves the examination of concrete cases.

How many squadrons ought France to possess, and what should be their composition? Such are questions which, to be answered otherwise than at haphazard, must be rigorously submitted to the control of military aims. They enter of their very essence into the subject under consideration.

The squadrons once constituted, it is necessary to put them in motion with a view to a naval action, to determine in consequence the conditions of their navigation, and to ascertain if its safety, or the dispositions to be taken in view of the battle which is our final aim, lead to adding to the fleet ships other than fighting ships properly so-called. The very interesting problems of scouting and search must naturally be faced, with care to accept only such facts as have been verified by experience.

Thus far we have disregarded all but purely technical considerations. We have given as it were a unique solution of an abstract problem; but things are very far from happening so in real life, and any naval strategy and tactics would be vain and illusory

which assumed that there are no restrictions upon professional ideas. Financial necessities fix impassable bounds to the total expenditure for naval forces, and those who have the important duty of preparing for war cannot ignore them.

I have only too often heard fine programs set forth, which had the sole fault of depending upon some magic purse, inexhaustible and bottomless, in which the minister of marine must find limitless resources. Strategy would be an easy game were this not absurd and impossible.

Actually, military resources are limited *in every country in the world*, and the limits are particularly narrow in France, where the expense of a powerful army must be met as well as that of a strong navy.

We have no right whatever then to ignore these special difficulties in our study of war.

And the expenses involved in constituting fleets do not stop with the construction of the fighting ships which form them. Stores of all sorts are necessary to allow the fleets to navigate; still more needed to replenish them, when they return to their home ports, after an operation of war, and to make them ready to set forth again. Arsenals provided with all the latest patterns of material, repair shops, dry docks, etc., must be organized in advance so that at their departure the said squadrons may be perfectly prepared, or, to use a vulgar but expressive term, in form, and that, on their return from cruising or from battle, they may be put in good condition as quickly as possible.

The question of supplies for the fleet and of arsenals is thus closely connected with strategy, and it will easily be made apparent what an immense capital, in stores of every kind, ought to be accumulated in time of peace by every maritime nation which does not wish to itself experience such grievous awakenings as those which the improvidence of the Spanish and Russian governments prepared for their unhappy countries in the course of the two recent wars.

However ample the expenditures for this purpose, they are truly economical when compared with the great and unproductive expense which an unfortunate war forces upon a conquered nation. And this is not all! Under penalty of accumulating for an adversary's use all these spoils of war, it is absolutely necessary to

shelter and defend them. The study of coast defence derives thence, and forms one of the most important branches of strategy.

To strategy equally belongs the right to fix the conditions which should govern the defence of the coast, the number of points to be defended, the means to employ, etc.

Always in the same spirit, and never losing sight of our guiding light, there is occasion to define the elements of naval defence, in combination with that of the coast, with a view to the necessary unity of action. Torpedo-boats, their especial utilization, their future rôle, the raison d'être of their employment, furnish ample matter for interesting developments which greatly justify the important place given to these little boats in the scheme of defence.

Submarines, and submarine navigation in general, are a not less important subject.

I shall tell no secrets in saying that during the last sixteen years the French navy has been presented with too many submarines of different designs, veritable laboratory instruments, incapable of any useful war service at sea; it has been too often forgotten that the naval engineer's art, even in its greatest perfection, is not sufficient of itself, and that to give life to his work he needs to be inspired by the military idea.

And it is because of this fundamental error that our flotilla of submarines, outside of certain types of which we possess too few, is quite unsuited to our military needs, and that, if we continue in the same path, we shall risk losing our lead of rival navies.

Having come to the end of the dryest, if not the least interesting part of our long exposé, we have to take up that which treats of the practical use of military studies and organization, certainly the part most open to prejudice, because we now draw near to our goal.

Advancing step by step, we have organized naval forces, and have provided for their upkeep and defence: the country possesses powerful means of action for any naval enterprise; how shall they be used?

It will at once be apparent, even to those of least competence in naval affairs, that the method of using this power will be quite different with different adversaries, depending upon their military resources and their remoteness from the original scene of war.

There is but a step from this conception to that of different eventualities, of variable combinations, in a word of war plans, or,

to use a happy phrase of Von der Goltz, *plans of operations*, worked out beforehand with a view to each particular case. Understand me well; it is not proposed to elaborate in the silence of the study plans based upon fixed and unvarying conjectures, in the chimerical hope that things will happen exactly so. I strive to accomplish something of real and lasting value, and am well aware that in war, as in a duel, attacks and replies are closely dependent upon each other. Consequently, in the field of war, even at the instant of effective movements, all previsions may be upet by some unexpected threat of the enemy. But, strategically speaking, it is indispensable to foresee in advance the principal lines of action, and, in consequence, to elaborate *plans*.

The German General Staff's opinion on this point is very clearly expressed in its work on the war of 1870:

"It is scarcely possible in the whole course of a campaign to repair errors made at its beginning, when the armies are being concentrated."

We shall see, in our study of the Russo-Japanese war, a striking confirmation of these words, Russia having really carried throughout the whole campaign the crushing burden of strategical errors made at its beginning.

Common sense alone should tell us that in all cases the method of prevision is infinitely superior to that of trusting to chance. With all due respect to the memory of a former French Minister of Marine, it makes one shiver to think that at an anxious time in our recent history, at a moment of such political tension as might at any instant plunge us into war with England, this Minister found no better instructions to give to the commander-in-chief of our principal naval force than these vague words, *"Take your whole squadron and cruise off Algiers."* We may esteem ourselves fortunate that war was spared to us, for we should certainly have been beaten.

Once more let me say that it is not any individual that I incriminate, and no word of blame will be found in my speech or writings for those who without doubt knew not that they were wrong. But I do protest most forcibly against such methods, and I shall struggle against the school of heedlessness and opportunism with an energy which arises from my profound belief that war is not a subject for improvisation. Should I have only succeeded at the end of this work in making all share in this belief, I shall feel

repaid for my efforts by the perception that I have contributed something new and useful to the work of my predecessors.

Even a summary draft of plans of operations is not only instructive, but indispensable, whenever strategy and tactics are discussed. And quite naturally, the application of these projects to special cases, to assumed adversaries, is indicated as the next step in logical sequence.

Such a study is particularly interesting because it permits us to pass in review the resources of every kind which a country has at its disposal, or which it ought to command—the facilities which its shores offer as a basis for its operations.

Thus, if considering our own case, the part which our naval forces might be called upon to play in a war with England, with Germany, or with other lesser powers, may be surveyed. The proper disposition of materials and men with a view to the prompt mobilization of the fleets, their concentration and distribution, and finally the proper objectives of the war, form so many subjects for discussion and for lessons of the highest interest.

Such a study is only possible, let us not forget, with concrete examples.

Once again I borrow from Von der Goltz, these profound and true words: *"Whoever writes on strategy and tactics ought not in his theories to neglect the point of view of his own people; he should give us a national strategy, a national tactics. Only thus will he render real service to his country."*

In these thoughts I have found a new justification for the method which by intuition I had adopted for the development of ideas.

The plan of operations ought to foresee, besides the movements and concentrations of naval forces in the vicinity of arsenals, those which take place afar off. New needs arise; bases of operation, points of support, depots from which stores may be replenished, are necessary to these fleets.

Principal bases, secondary bases, so many means of action without which modern fleets cannot do, and the proper appreciation of which demands above all a far sighted policy, then stable military institutions ruled by a spirit tenacious and foreseeing. What patient labor, continuous and persevering effort, this part of the preparation for war exacts, under penalty of suffering the bitter and cruel trials of Spain and Russia, may already be imagined.

All the preparations for war are made with a single end in view, *battle*, and all the elements necessary for its fruitful discussion are in our possession at this point in our study.

Here we enter more particularly into the realm of tactics. Assuming the opposing fleets in contact, that is to say where, having knowledge of each other's positions, they are manœuvering with a view to a meeting, the first thing in order is to inquire what means are employed to move them.

The evolutions or formations, all combined movements in close order on the field of action, the signals used to order those movements, in a word the whole aggregate of diverse precepts so improperly grouped under the false title tactics—which should not at all be confounded with the art of engaging or sustaining battle—these multitudinous subjects contain inexhaustible mines of useful knowledge.

I will even say that the interest which attaches to all phases of the fighting which is the true goal of war is so intense that it would be much more logical to attack the problem analytically instead of treating it by synthesis, as I have done. As a matter of fact, all conceptions of war, fully to meet its real conditions, must rest upon the deductions drawn from the study of battles and take account of their least incidents. But such a method falls within the province of the General Staff, since, to be fruitful, it needs special knowledge not yet possessed by a great number of the officers for whom this book is intended.

After the battle waged to assure the conquest of what we shall see later on in detail to be the final and highest objective of every naval war, namely, command of the sea, operations of a special kind may take place. I refer to what are generally called combined operations, such as occur in the case of the invasion of a hostile country, and in which the navy's rôle is to convoy the transports, to assist in the disembarkation of the army and to protect its lines of communication.

There necessarily exist, then, certain conditions which make possible this sort of operations, and certain measures which it is wise to take in order to insure their success.

Have I thus completed the exposition of the program of a complete study of naval strategy and tactics? No, there remains one last subject, and not the least important; for if I have thus far spoken exclusively of the material forces with which preparations

for war must reckon, there is still a word to be said of moral forces, at least as essential as the others; history shows the influence upon the fortune of war of the professional instruction of crews and of officers, of their power of endurance and of their faith in a successful issue.

"*An important condition,*" says Von der Goltz again, "*is that the morale of the army be good*" and also: "*It is essential that the Commander-in-Chief, as well as the troops, shall have the firm will to conquer.*"

After Tsushima, we may well consider these words prophetic.

Doubtless some will think that I have dwelt too long on the program. I do not think it time wasted, if I have succeeded in opening to view the *philosophy* of a complete study of naval strategy and tactics, and finally and above all because we now know exactly what we seek and whither we go.

A good program is the skeleton upon which the substance of a book must be moulded into shape, and the labor of erecting it first of all is a useful one. In glancing hastily over this vast and complicated program I cannot help thinking of the imperishable rules of the wonderful *Discourse on Method,* of which a better application than to the work of preparation for war could not be found: "(1) Never to accept anything as true which we do not clearly perceive to be so; to carefully avoid precipitation and prejudgment, and to include in our judgments nothing more than that which presents itself so clearly and distinctly to our minds that we have no reason to doubt it; (2) to divide the difficult questions which we have to decide into as many parts as may be possible, and as may be required in order to better solve them; (3) to arrange our thoughts in order, beginning with the simplest objects and those easiest to understand, rising little by little, as by degrees, to the understanding of the most complicated, and even assuming that there is order among those which do not at all naturally flow one from the other; (4) finally to everywhere make enumerations so full and reviews so complete that we may be assured that we have left nothing out of consideration."

As I began by saying, the present work is devoted solely to that part of this *vast study* which concerns the exposé of principles.

CHAPTER I.

The Military Art of Alexander, of Hannibal, of Cæsar, of Frederick the Great and of Napoleon; the Naval Strategy of Napoleon.

In taking up the historical study of the great wars of the past, I think it useful to insist upon the important point that my aim is not to teach this history; others more competent than I have done that. I shall suppose it to be wholly known, and shall devote myself solely to pointing out the useful lessons which can be drawn from it from the point of view of the military art.

As soon as this study is undertaken with this objective, it is impossible not to be struck by the fact that at every epoch, whatever the surroundings and the instruments, the same faults have brought on the same disasters, as also identical precautions have always insured success. It is on this account above all that the study of history is fruitful; it is so much so, as I hope to demonstrate, that it does not seem possible that any military organization should fail to take account of it. Rightly has it been said, *History repeats itself.*

If I begin by examining the campaigns of great warriors, it is because, despite the differences, more apparent than real, between armies and fleets, there is truly but one strategy and its principles are of general application. It is in tactics particularly that the differences are emphasized, since by its very nature tactics is influenced by weapons and their multiple variations.

Two very different methods may be pursued in the application of history to research for the principles of war; either some war may be taken as a type and analyzed in all its details to extract from its successes and its failures a lesson of general application, or, on the contrary, a large number of examples, taken in all ages, may be examined more superficially and having regard only to the general plan.

I have deliberately chosen the second of these methods because of its undoubted superiority from the teacher's point of view. If the first is really more satisfying to a specially cultured mind—and

I cannot too strongly advise officers to practice it perseveringly—the second is better adapted to teach basic principles from the fact that it furnishes proof of their universality.

ALEXANDER.

The primordial interest of historical documents in the study of war is amply proved by the absorbing interest which they have had for the great soldiers of all ages.

We read in the Life of Alexander by Quintus Curtius: *"He invariably carried with him the works of Homer; according to his own words, they were his stores for the campaign; they were the school to which he went for lessons in warfare, and he was often heard to envy the good fortune of Achilles, who had such a herald of his glory."* What were the special characteristics of the genius of this great warrior? All historians agree upon this point; he was gifted above all with extraordinary activity and rare determination. *"He himself recognized that he owed success to his activity. When he was asked by what means he had been enabled to conquer Greece he replied—By losing no time."*

To this same activity Alexander, *who feared nothing so much as delays,* Quintus Curtius says, owed his unbroken series of victories, won with a handful of men over innumerable hosts of barbarians, and that marvelous conquest of Persia.

We shall find this essential quality of a leader in all the great men who have made their names famous on battle fields; Napoleon, Suffren, and particularly Nelson. It is inseparable from victory.

But whatever may be the value of this moral factor, in studying Alexander's campaigns we shall seek something else; we must find in his conduct the military principle which guided him.

We shall find it in its entirety in an incident of the battle of Arbella. At the height of this hot action, Parmenion sends to warn the king that the Persian general, Magius, is attacking the baggage trains, and he asks orders to go to their protection. Alexander replies: *"If we carry off the victory, we shall recover what belongs to us and moreover become masters of all the enemy's possessions. Let him take care then not to separate the least part of his forces from the field of battle, but rather, in a spirit worthy of my father Philip and myself, let him fight valiantly and despise the loss of a little baggage."*

Thus, for the Macedonian king, the principal objective, to which all others ought to be subordinated, was the defeat of the hostile army, in one word, battle. He calculated that the surest way to attain *the ends of the war* is to destroy the main forces of the adversary.

And he carried this conception of war to its extreme logical conclusion when, after a victory won, he pursued the enemy with indefatigable activity to complete his overthrow. After the victory of Issus, he chased Darius and his scattered forces with savage energy, without giving them truce or respite, and only stopped when his own troops were worn out. He rightly estimated that in war there ought not to be any half victories and that it can only cease with the complete crushing of the enemy.

These statements appear like arrant commonplaces, they are so agreeable to common sense, and yet, as we shall see later, our country has suffered its most grievous defeats through having too often forgotten them.

Alexander had, moreover, a profound belief in the superiority of the attack over the defence. In an address to his soldiers before the expedition against the Persians, he expresses himself as follows: *"Promptitude has a thousand advantages which pass over to our enemy if we waste time in sluggishness. The first impression is a great point in affairs of this kind, and that is always in favor of the one who attacks . . . . The strongest, in the common view, is he who makes war, not he who awaits it."*

In these words lies the germ of a doctrine attaching special value to the *offensive*, which, after twenty-two centuries, has in nowise become obsolete. Besides the sure moral effect which places the one attacked in a state of undoubted inferiority, the ignorance in which the latter necessarily is as to the progress of the aggressor constitutes a new cause of disadvantage.

Nor was Alexander the only one convinced of the high military value of the offensive. The Persian general Memnon, deeming that *it is a truth which no one doubts that it is better to wage war in a foreign country than in one's own*, had proposed to invade Macedonia. The plan was rejected, with what result one knows.

Among the qualities from which Alexander drew great advantage, his perfect understanding of the weak points of the enemy must be cited. If he dared to launch himself with a small army against the innumerable troops of the Persians, if he never re-

coiled from enterprises as bold as the passages of the Granicus, of the defiles of Cilicia and of the Tigris, always in the presence of an enemy much stronger than himself, it is because he understood the latter's customs, his indecision and his inactivity, all factors of which the greatest account should be taken. And this is the more important to us because we shall see later on other great warriors, Nelson for example, plunge into enterprises so audacious as to be almost blameworthy, if the certainty that the adversary would not know how to oppose himself to them had not made them legitimate.

The fine discipline which he instilled into his phalanxes permitted him, moreover, to balance their numerical inferiority by the exceptional quality of his troops. "*The men, attentive to the least sign from their leader, have learned to follow their flags and to preserve their formation. Whatever is ordered, all execute: to face the enemy, to outflank him, to attack one wing or the other, to change the order of battle, are manœuvers as familiar to the soldiers as to the captains.* He also counted *upon the worth of his soldiers, accustomed to victory, whom courage and experience in arms made invincible.*"

In these citations are condensed, in reality, several main factors of the important formula of preparation for war.

Trained armies, accustomed to all drills, broken to the ways of their chief, in which the men touch elbows, are half the victory, but such results cannot be attained for the first time on the battlefield; preliminary training is necessary, the patient labor of a time of peace.

Finally these same citations contain valuable indications of the fighting tactics of Alexander the Great: *to attack one wing or the other, to outflank the enemy;* would one not suppose in hearing these words, that they referred to the operations of poignant reality of which but yesterday Manchuria was the bloody theater?

To manœuver his troops so as to be stronger at *one point* of the field of battle than these who opposed him *at that point,* such is the great principle of war which the King of Macedonia constantly applied and to which he owed his persistent triumphs. It is by this same tactics, although with different means, that in the course of history the great generals and also great admirals will carry off with a high hand their victories, despite being in most cases the inferior in point of numbers.

HANNIBAL.

The study of the Punic Wars, a century later, will furnish us with an ample harvest of interesting documents, especially from the naval point of view. Mahan, in his remarkable work, the Influence of Sea Power upon History, has already made it quite clear that Hannibal's final defeat in his titanic war against Rome was solely due to the fact that he was not master of the sea. But the American historian, in my opinion, has treated only one side of the question, and it does not seem superfluous to reconsider it.

As a matter of fact, Hannibal's part, which was during the second Punic War, was only one phase of a deadly strife, which began before him and lasted till after his time, for the conquest of trade supremacy. For it was truly trade rivalry which brought face to face the great commercial city of Carthage and her rival in the path of expansion, ambitious and insatiable Rome, in a field too narrow to satisfy both at once.

Do we not find in Suetonius this thought: *No commerce will be possible between Italy and Africa until Carthage has been destroyed.*

In recalling this memory of far off times, we cannot help connecting it with the doings which at this moment are being disclosed to us and which, from identical economic causes, are arming for approaching strife two great European powers. Is it not true once more that history repeats itself?

In a memoir rewarded by the Académie des Inscriptions et Belles-lettres in 1784, and having for subject: The Influence of Naval Strength upon the Power of the Greeks and Romans, the author says:

"*But for fear of Carthage, the Romans would perhaps never have had a navy. The colony of a race of seamen, the Carthaginians were scarcely established before they became traders. Commerce gave them birth, commerce supported them and facilitated their growth, commerce alone gave them strength and riches . . . . It was against them that Rome undertook her first naval ventures. After having subdued the Tuscans, the Latins, the Samnites and all the neighboring peoples, she sought further conquests, and Sicily became the object of her desires. Fortune served her useful ambition; I say useful, for without it not only would the Romans never have raised themselves to a height of greatness which astonishes posterity, but the products of their*

country would not have sufficed for the rapidly increasing number of its inhabitants.

"Among all the scenes of battle which history displays with so much prodigality, there is none more interesting than that of the Punic Wars; at least there is none which has had more influence upon the happiness of the world. There may be seen two powerful nations, whose successes have increased their desires, attempting to make everything yield to their conquering arms. Conquerors and conquered, by turn, these worthy rivals fight for, seize, and take back again the empire of the seas; and this astonishing spectacle becomes still more so when, as leaders in it, are seen the greatest generals that ancient times have known. Nature might be said to have been under the orders of fortune and to have been eager to serve ambition.

"The Romans had the better luck. A Carthaginian galley, cast by a storm upon the shores of Italy, furnished them with a model, and within two months they had one hundred and twenty ships, sailors and rowers.

"Victory suddenly crowns their zealous industry. Scarcely launched upon the sea, they make its masters tremble. Mylæ, Ecnomos, the whole of Sicily, are witnesses of their success, and Africa will soon have new rulers."

This quotation will not appear too long to those who consider it well and think of the same causes which, to-day or to-morrow, will bring to blows, in a struggle of life and death, England and Germany, just as they armed, one against the other, more than two centuries ago, England and Holland.

The Punic Wars, then, were born of a reciprocal feeling that Rome and Carthage could not live side by side and that one of them must disappear.

They had Sicily for their first field of operations, and its conquest for their first objective. But Rome was not slow to perceive that she would never be able to take the island from her rival so long as the powerful Carthaginian fleet could, with impunity, traverse the seas, supplying her forces with stores or bringing re-enforcements.

There was only one logical and reasonable solution; since the Punic navy constituted the principal force of the enemy, it was that which must be destroyed. The Roman Senate understood this, and as they had no fleet, caused one to be built, thus showing

remarkable intuition in matters of war. We shall see later that, owing to their not having the same good sense in analogous circumstances, the government of the unhappy Russian people drew upon their country the most lamentable disasters.

Happily not so much time was required three centuries before the beginning of our era as would be now to build a navy; at the end of a few months it was fully equipped and ready.

Then began an eager pursuit of the Punic naval forces, ending in their defeat at Ecnomus, and in the Romans' securing for a time the command of the sea. I say for a time, because this command of the sea was a veritable barometer of victory during the first Punic War. In Sicily, as in Sardinia and Corsica, the many battles fought by the armies of the two rival cities were never decisive. No sooner would Rome, having won an advantage, seek rest in fancied security, or allow her fleet to fall into danger, than Carthage would again seize command of the sea and throw new forces into the islands, and vice versa.

The famous Hamilcar, holding thus in check all the legions sent to Sicily to rout him, the Roman Senate once more perceived that the only possible way to conquer him was by cutting him off from his base of operations, Carthage, by regaining command of the sea.

The time was propitious, for, as the historian Polybius says, "*The Carthaginians, convinced that the Romans would never think of building up again their navy, in their contemptuous feeling of security, had greatly neglected their own.*"

The reconstructed Roman fleet soon afterwards met the Carthaginian fleet at Aegates and destroyed it; Hamilcar, cut off from Carthage and starving in Sicily, had to surrender, and his vanquished country to agree to peace with humiliating terms.

These facts, far removed from our times as they are, clearly foreshadow the importance which naval supremacy will assume in later times, and for that reason we could not pass them by unnoticed.

Rome has now to reckon with a redoubtable adversary, Hannibal, one of the greatest captains of all time, of whom Thiers could say, "*Napoleon, a greater soldier than Cæsar, first by being more of a specialist in the profession of war and then by his boldness, depth of insight and inexhaustible fertility in combinations, has had in these respects but one equal, or, if one may dare to say it, superior, Hannibal.*"

But the culpable carelessness of Carthage, which allowed the Punic naval power to be endangered, while that of Rome continued to increase, deprived her general of a primary element of strength in the ardent and merciless struggle which now began for the conquest of leadership in the Mediterranean.

Like the great warrior that he was, Hannibal understood that it is necessary to strike at the very heart of a strong nation in order to overthrow it; to conquer the Roman Empire, war must be carried to the doors of Rome herself. *But Rome was mistress of the sea,* and undisputed mistress, since, after the battle of Aegates, only a memory remained of the powerful Punic navy.

The way by land alone was left for Hannibal to take, and this led him through Spain and Gaul, across the Alps into Italy. Followed that great drama, so well known, which after so many centuries still evokes our admiration, for nothing greater from the military point of view has ever been done. His idea in adopting this strategic plan was to keep in constant touch with his base of operations, Carthage, by land communications wholly, except at the narrow strait of the Pillars of Hercules, into which he did not think the Roman fleets would dare to venture. But this was an idle dream. After his memorable passage of the Alps, his invasion of Italy was an uninterrupted succession of triumphs and loosed against the power of Rome the most terrible storm which ever menaced that republic. The great victories of Trebbia, Trasimenus and Cannæ were its three bursts of thunder, which, however, by their very violence, caused an abatement of the storm. Such successes were not purchased without losses felt by the victor; his effective forces, already weakened by the difficult passage of the Alps, diminished at each battle, and to maintain his strength reinforcements from home were necessary.

These could come to him by two routes only; the most direct, by sea, was almost continuously closed to him, the various attempts at revictualing by fleet and convoy during this war having, with very few exceptions, failed, owing to the superior Roman fleet barring the way: by the second, the land way, the communication was slow and difficult, and its only serious trial failed, just at the point of success, with the defeat of Hasdrubal in Cisalpine Gaul. Supposing the junction of the two brothers to have taken place, Hannibal would have doubtless been able to prolong his resistance, but the final result would have been the same.

Energy uses itself up when it is not replenished: but Rome at the critical time found a man who, taking inspiration from the principles of war of Hannibal himself, went on to apply them with means of action which his rival did not possess. Scipio Africanus first drove the Carthaginians from Spain, and thus with the same blow cut the bond, so attenuated, so fragile, so long, and consequently so precarious, which connected the invading army with its base; then, assembling an expeditionary force in Sicily, he threw it into Africa and thus threatening the heart of Carthage consummated at Zama the defeat of Hannibal, whom his country in desperation had recalled, and the complete overthrow of the Punic power.

Thus it was of no use to a great nation to have in its service one of the greatest geniuses of the human race, so great that by a veritable military paradox he succeeded for fourteen years in maintaining himself on Roman territory and, although weakened and almost stripped of everything, in terrorizing Rome. That nation had not given him the means of conserving the fruits of his victories by assuring a permanent connection with the source of his life, his mother country. She could not but be vanquished. Her rival had but one good general, who copied the military processes of the great leader; but he always had assured communications and the certainty of being kept reinforced. He finally won the victory, and we shall see later on that all similar historical situations have the same denouements. What would not Hannibal have accomplished with the same facilities? Rome would have been conquered and the destinies of the word changed.

The retrospects of the Punic Wars furnish us with other not less valuable lessons: the Roman fleets did not at once attain to the high degree of efficiency which gave them the final victory over those of Carthage. They began with painful experiences and severe trials; their crews were not inured to the hardships of sea life, and repeatedly numerous ships were totally lost on the coast of Sicily as a result of the inexperience of the Roman sailors. So true it is that in no age of the world can a navy be improvised, that being always the work of time.

Among the characteristics of the genius of Hannibal, his perfect understanding of the human heart served him well in all his warlike undertakings. A profound politician, he knew how to use to his own advantage the hatred of the peoples subject to Rome,

as well as to acquire over his own troops a prestige and an ascendancy which inflamed them with zeal.

CÆSAR.

Cæsar himself also showed unwearying activity in war, as well as many other of the qualities of his illustrious predecessors. We read in his *Commentaries:* That he surprised the Helvetii, *"astounded at his sudden approach and to learn that he had crossed the Saone in a single day, which they had scarcely done in ten."*

To prevent the Suevi from getting possession of Besançon, he hastened there by forced marches day and night and seized it himself. We also find in him that peculiar aptitude of the warrior to seize every occasion to profit by the weaknesses of an adversary. After his first skirmish with Ariovistus, *"Cæsar, having asked the prisoners why the king did not accept battle, learned that according to the customs of the Germani the matrons had to decide, by spells and omens, whether or not it was propitious to engage in battle: but they had declared that the Germani could not win if they fought before the new moon."* Without loss of time, on the following day he attacked, despite the disproportion of forces, and victory rewarded his boldness.

In our own time there always exist causes of demoralization which, though quite other than those of ancient times, are not less real, as the war in the East proves: they will have a considerable influence in the final fate of future wars, for the strength of an armed nation is made not only of its own force but of the weakness of the one which is opposed to it.

It is in the course of the same action that the fighting tactics commonly used by Cæsar are revealed to us: *"having observed that the enemy's left was his weak side, he himself attacked with his right wing."*

On the other hand, he knew too well the importance of a careful preparation of the soldiers to have sacrificed this indispensable gage of victory: the proof of this is found in the *Commentaries*, apropos of a battle with the Nervii. *"In this difficult position there were two resources: the first was the experience and skill of the soldier who, instructed by previous engagements, knew as well what to do himself as if orders were given to him, ...*

Each lieutenant, without asking for orders from the general, himself took the best practicable dispositions."

And this calls attention to the very great value of an armed force which has undergone long and patient training, and in which each important unit thoroughly understands the ideas of the chief. We shall meet with this invaluable element in many circumstances of war, but always on the successful side.

One episode in the course of this memorable Gallic War is of quite special interest to us: I refer to the campaign against the Venetii. These latter had a numerous fleet of strong vessels with lofty bows and equipped with very substantial sails made from skins, built to withstand the stormy weather of the inhospitable coasts of Britain. The Romans had only galleys too slightly built for the heavy seas of that vicinity. And yet Cæsar, with his clear understanding of the principles of war, did not hesitate to attack the fleet of the Venetii, because he well knew that this fleet constituted *the main force* of the enemy and that by destroying it he would take the surest means to bring the war to an end.

As a matter of fact, the towns of the Venetii were built at the ends of promontories, and, surrounded by the sea at high tide or by wide marshes at low tide, were quite inaccessible. Only by the long and laborious construction of works such as dykes could they be approached, and their inhabitants only abandoned them one by one, escaping in their vessels, and thus prolonging their resistance.

If I seem to linger unduly over deeds of twenty centuries ago, it is because similar ones occur in every military enterprise, although the ending is not always quite the same. But, let me hasten to add, that, as we shall see, victorious generals always do as Cæsar did.

The aim of every war is to bring one's adversary to his knees completely and as quickly as possible: there is no more certain way of reaching this end than by destroying his principal forces.

Taking advantage of the favorable circumstance of calm weather, which deprived the Venetii's fleet of its natural superiority, Cæsar completely defeated it, and that people soon made its submission.

One of the translators of Cæsar's *Commentaries* has well defined his many and remarkable qualities: *"He had moreover all the qualities which go to make a good general: prudence, coolness, activity, boldness, a mind fertile in resources, a sure and clear*

sight which covered the general features of the vastest project and comprehended all its details, a wise restlessness which made him feel THAT HE HAD DONE NOTHING SO LONG AS THERE REMAINED ANYTHING TO DO, *a courage to surmount all obstacles, great understanding of men, the art of making himself loved and respected by his soldiers."*

I have made this quotation because it includes not only the definition of the great military chief, but also and primarily the formula of the art of war in its broadest sense and for all times. I have purposely underlined one phrase which contains the secret of many historical triumphs; to speak only of Suffren and Nelson, they also never thought their task finished so long as the end which they had fixed for themselves was not attained.

It is opportune to here recall a word of Napoleon's of striking truth: *"No great continuous actions,"* said he, *"are the results of chance and fortune. Rarely are great men seen to fail in their enterprises . . . . Look at Alexander, Cæsar, Hannibal . . . . they always succeeded. Is it because they were lucky that they thus became great men? No, but because, being great men, they knew how to master fortune. When we study the causes of their success, we are astonished to find that they did everything to obtain it."*

The transition from these ancient wars to those of times nearer our own may, without disadvantage, be very brief. Lieut.-Colonel Hennebert has covered the ground very well when, speaking of Hamilcar, father of Hannibal, he expressed himself as follows: *"The great Carthaginian understood all the importance of marches, and it may be said that he invented them. Till then only wars of siege and place had been waged, and the singularly timid movements of armies consisted only in queer rotations about one or several places taken as pivots. The shrewd Barca resolutely broke with these slow and monotonous methods. His son Hannibal, who twenty years later surprised the Romans by so many unexpected and rapid movements, was to carry on this revolution in the military art, which Julius Cæsar will bring to its climax. These three great men once vanished from the scene, an insurmountable routine will again bring into favor the old methods, which will remain solely in use in Europe until the time of Gustavus Adolphus: then only will Hamilcar and his son Hannibal be remembered, and modern peoples will see the phases of a new*

revolution develop. At the time of this renaissance, Turenne, Condé and Vauban will lay down principles, of which the great Frederick will make the most successful application, and from which the Emperor Napoleon will gloriously deduce all the consequences."

Let us note in passing, in the preceding lines, the precise idea of the strategic importance of speed.

FREDERICK THE GREAT.

The great Frederick's campaigns are an interesting study, at least in their broad outlines: the first of his reign are characterized by a constant regard for the offensive, so far at least as it was permitted by the ideas of that time and by the difficulty of revictualing armies due to the system of storehouses.

To make this offensive action possible, seasoned troops were needed, practised in marching and manœuvering, under rigid discipline, all matters to which the Prussian king attached great importance and which he endeavored by every possible means to obtain.

He prepared, in this manner, the manœuvering armies which were necessary for the application, on the field of battle, of his favorite tactics of concentration against the weak point of the enemy's army, most frequently one of its flanks. The successful use of this plan required an oblique march, out of sight of the enemy, carrying the main body of his forces against one wing of the enemy, a delicate manœuver which only rapidity of execution and the endurance of soldiers inured to warlike exercises could make successful.

Frederick's tactics in reality amount to nothing more than this extremely simple plan of battle; to it he owed his wonderful successes in the first four campaigns of the Seven Years War, despite the notable inferiority in numbers of his armies relative to the allied forces. The frequency of his victories over more numerous enemies can only be explained by the excellence of a simple plan in which the idea of the superiority of forces concentrated at one point of the battle field is disclosed.

This simple tactics must not be confounded with the manœuvers and complicated exercises of the drill ground, which came so into fashion after the Seven Years War under the name *Prussian Exercises,* which the Prussian king never really used on the

battle field, and which served him rather as a "bluff" to frighten Europe and so avoid new wars in which he feared to compromise his successes.

Here a comparison is forced upon the seaman, who in every military idea naturally seeks to find an application to naval affairs. At sea, even more than on shore perhaps, the need of well drilled forces appears evident. It is on a liquid plain, with no inequalities of ground to conceal one's movements from the enemy, that a fleet must be manœuvered so as to bring its whole weight to bear upon a weak point. How could one hope to accomplish this without a long and methodical preliminary training in time of peace, accustoming the ships to navigate and to evolute in close order with the maximum precision and rapidity? The concerted manœuvers which alone can give to an armed force that unity which will enable its chief to obtain the greatest results from the war machine which it really is cannot be improvised on the field; they are the fruit of a long and patient preparation which cannot be too particular of details.

From this point of view, the evolutions and formations of squadrons, which some superficial minds rather hastily condemn as useless, have an indisputable value, even if we see in them nothing more than a system of naval gymnastics, giving to the personnel a flexibility and a cohesion in manœuvering together, from which a sure benefit will be derived on the naval battle field.

I seize this opportunity to condemn the strange opinion of those who refuse to see in the exercises, voyages or periodical manœuvers of squadrons anything but pretexts for throwing away money in smoke; profound ignorance of the requirements of war can alone explain this point of view.

The great Frederick's method must be regarded as a good one, but with the condition that *Prussian Exercises* be rigorously proscribed upon the sea still more than on shore; that is to say all too complicated movements or evolutions requiring excessive use of signals.

In this connection, we refuse to accept those more or less learned combinations which under the pompous title of tactics are really only applications of a purely speculative geometry. Actual war on the field of battle has no relation with the theoretical figures which a complacent imagination conceives on paper or executes when guns are silent.

NAPOLEON.

Still more admirable in their simplicity were the methods of warfare of Napoleon, "the master of masters" as General Bonnal has called him.

The great Emperor's method he himself described when he summarized it in the phrase, "*To march ten hours a day, to fight and then to rest.*"

This brief formula really contains a whole system of strategy. In the first place it postulates the immutable principle of rapidity, accepted by all great leaders as an article of faith of the military gospel throughout all ages, and so well known as such that it is astonishing to see it again brought into discussion in our own times. In the second place, it sets forth with precision the idea that fighting is of primary importance and the principal objective.

Bonaparte made the first application of his fine conception of war in the immortal campaign of Italy. He knew marvelously well how to draw advantage from the customs of his epoch, according to which the armies opposed to him, greatly superior in numbers to his own, occupied very extended fronts, with a view to increase the development of their fire. These forces thus disposed, and necessarily manœuvered very little, offered numerous points of weakness against which the young general directed the whole effort of his troops animated with the tremendous activity which he knew how to inspire in them.

He also might have said, as Alexander the Great did, that *he won his battles by not losing time.*

Though his armies were almost always inferior in numbers to those of his adversaries, still he constantly beat them by securing a numerical superiority at one point at a given moment. No one better than he has known how to show the exact meaning of superiority of military force.

It is fair to note that his genius benefited greatly by the radical transformation which took place in the composition and spirit of the French armies from the end of the eighteenth century. The powerful inspiration of the Revolution had animated the hearts of the soldiers and implanted in their minds the profound sentiment of a struggle for the *fatherland,* an ideal thenceforth sacred. The ***armed nation*** was about to supersede, for the first time, professional armies, composed of mercenaries. This great moral force

was to be one of the most efficient instruments by which the genius of Bonaparte won victories.

Carnot had really already laid down the laws of the equilibrium of military forces and stated the principle of concentration against a weak point of the enemy so as to obtain superiority at that point. But the instrument for applying this fruitful principle was lacking, or, to speak more accurately, that instrument was not yet sharpened.

Another of the great elements of strength in Napoleon's military power was his constant and judicious economy in the use of forces. The word economy must not be here taken in the sense of parsimony, for, quite to the contrary, he himself laid it down as an axiom *"that the very last man ought to be expended, if needful, on the day of battle, because on the day after a complete success there are no more obstacles to surmount and public opinion by itself alone assures new victories to the conqueror."* Economizing here signifies holding in reserve ready to make the decisive effort at the selected time and place.

"Have no lines at all, but keep all your troops united and grouped together around Genoa, with your depots in Savona," he wrote to Masséna at the beginning of the campaign of 1800, and he added: *"Such are the true military principles; by acting thus you will beat fifty thousand men with thirty thousand and will cover yourself with an immortal glory."*

This campaign of 1800 offers a fine example of the primary importance of strategic combinations prior to any other operation of war. France was about to face two armies, operating upon two very different fields, the Rhine and Italy. Under penalty of scattered efforts resulting in sure inferiority everywhere, a choice had to be made between the two objectives according to their relative importance.

Napoleon, in his *Memoirs*, has himself explained the motives of choice and the reasons which led him to regard the German frontier as of predominating importance and that of Italy as secondary.

"If the army of the Republic had been beaten on the Rhine," said he, *"and had conquered in Italy, the Austrian army could have entered Alsace, Franche-Comté or Belgium, and have followed up its successes without the French army, victorious in Italy, being able to make any diversion capable of stopping it, since to establish itself in the valley of the Po would have necessi-*

tated the capture of Alexandria, Tortona and Mantua, which would have needed an entire season."

"If the French army on the principal frontier, the Rhine, was victorious, while that on the secondary frontier, that of Italy, was beaten, all that need be feared was the capture of Genoa, an entry into Provence or perhaps the siege of Toulon. But a detachment of the French army of Germany, descending from Switzerland into the valley of the Po, could stop short the enemy's victorious army in Italy and Provence."

I have cited this case because it shows better than any amount of reasoning how important it is in war *to prepare* operations; this task, as essential on the sea as on land, belongs to strategy. This example also indicates the necessity of making a rational choice from all the possible operations, and above all of not leaving the decision to chance; the part played by fortune in the events of war is too important already for us not to try to limit it as much as possible.

It is extremely fortunate that any dominant conception which is sought for in the military acts of Napoleon, can be learned at first hand, since he himself took care to make it known. For those of us especially who wish above all to discover the philosophy of the principles of war of all times, this method of letting the authors themselves tell what motives they obeyed, is much more fruitful than any other based upon a dry and often arbitrary description of battles.

"The force of an army," wrote he in his *Memoirs, "like momentum in mechanics is measured by the mass multiplied by the velocity."* How unmistakably suggestive it is to observe the unanimity of great warriors in taking speed to be one of the essential means of action. This fundamental idea ought to be pointed out on every occasion, for, despite the preponderant part which it has played in all the wars of the past, some still contest it in our time. As to the mass, that is to be taken in the sense of the superiority of effort at a given point, and to quite enter into Napoleon's idea, his decisive acts in war give us the right to affirm that he gave greater weight to velocity than to mass in the product in question. That is what enabled him to beat armies much greater in numbers than his own with troops endowed with extreme mobility.

In that inexhaustible mine of able thoughts, the *Memoirs* of Napoleon, we find this too: *"A great captain ought to say to*

himself, several times a day: If the enemy's army appeared in front, on my right or on my left, what should I do? If he finds himself embarrassed, he is badly stationed, he is not according to the rules, he ought to seek a remedy."

Thus has he laid down the principle of prevision in matters of war, and at the same time the condemnation of the formula, "The future will take care of itself," in accordance with which too often in our history affairs have been left to the guidance of chance. And, moreover, this plan has been too unsuccessful at all times not to be vehemently rejected to-day, not to cause us to combat with energy the opinion, too often countenanced, that, in the absence of incontestable doctrines in military, and especially naval, affairs, *leave everything to the inspiration of the moment* should be the only rule. Such reasoning conducts inevitably to defeat.

Yet an analogous principle is very familiar to those of us who are seamen. The officer is taught, as the very grammar of his profession, that his first thought on taking the watch at sea should be to review mentally the possible contingencies, the meeting with ships, the saving of a man overboard, etc., so as to have clearly in his mind what should be done in the existing state of weather and sea. This excellent professional habit, which leaves nothing to the uncertainty and hesitation of unpreparedness, appears so natural to us merely because our naval education has changed it from a conscious to a reflex action.

Therefore this same principle can have only fortunate results in that so much more important and vast sphere of war.

"Every war conducted according to the rules of the art is a systematic war, because every war ought to be conducted in conformity with the principles and rules of the art and to have an objective; it ought to be carried on with forces proportioned to the obstacles which are foreseen," said Napoleon; and again: *"Alexander, scarcely more than a boy, with a handful of men conquers a large part of the world, but was this a mere onslaught on his part, a sort of rush? No, all is profoundly calculated, boldly executed, wisely conducted.*

Cæsar conquered the Gauls and overthrew the laws of his native land; but were his great deeds of war the result of chance and mere luck?

Will it be believed that Hannibal owed his career and so many

great actions only to the caprices of hazard, to the favor of fortune?

"All these great captains of ancient times, and those who later on have worthily followed in their steps, only did great things by conforming to the rules and natural principles of the art; that is to say, by the correctness of their combinations and the logical relation of means to ends, of efforts to obstacles; they only succeeded by obeying correct principles, whatever may have been the audacity of their enterprises and the extent of their successes. They never failed to treat war as a true science. It is in virtue of this alone that they are great models, and it is only by imitating them that we can hope to rival them."

That success in war cannot be the result of chance stands out from these words with repeated and intentional emphasis, and establishes itself as their logical conclusion. A truth so fundamental, from the pen of such a man, ought already to have the force of a law; the most recent facts of military and naval history have just shown us what the cost is to nations which, ignoring it, have foreseen nothing and prepared nothing.

Clausewitz has defined Napoleon's method of war in these terms: *"To begin by striking hard, to take advantage of his successes to strike again, to always and unceasingly stake all he has on a single card till the bank breaks: such was Bonaparte's way and it is precisely to this correct conception of war that he owes his incredible triumphs."*

This judgment of a military writer of distinction shows how great a place fighting had in Napoleon's military designs; he surely assigned to it the principal rôle. If we add that his perfect understanding of the military customs of his epoch always permitted him to foresee the faults which his adversaries would commit, and to take advantage of them, we shall have a view, succinct but as complete as possible, of the *simple* means which constituted his method. It may well be thought that the constant study which he made of the history of great captains was not lost upon him.

However powerful the interest which would attach to a more complete study, entering more into the details of the life and acts of this great military figure, even from our special naval point of view, I must here close this brief survey in order to take up another subject, of more direct interest because it affects us more nearly. I refer to what has been called *Napoleon's Naval Strategy*.

THE NAVAL STRATEGY OF NAPOLEON.

This matter is of special importance to us because its discussion will bring out the essential differences which exist between war on the sea and war on land.

There is no doubt whatever that Napoleon had a naval strategy, for he was too much a soldier not to feel profoundly that certain fundamental laws are true, whatever the circumstances, and that, in particular, naval operations are no more amenable to chance alone than land campaigns are. Moreover, to learn what his conceptions of naval strategy were, we have only to take his own words, which will greatly facilitate the investigation.

Possessed, ever after the campaign of Italy, by the fixed idea of overthrowing the English power, and too deeply penetrated by the true principles of war not to seek to strike at her very heart, he cherished the plan of an invasion of England.

On November 5, 1797, he wrote from Milan to the Directory: *"To undertake, with some probability of success, the English expedition, there would be required: (1) good naval officers; (2) a large number of well led troops in order to be able to threaten several points and to re-inforce the landing party; (3) an intelligent and vigorous admiral. I think Truguet the best . . . ."*

Later he returns to the subject, this time specifying the most serious difficulties of the enterprise: *"Whatever efforts we may make,"* he writes from Paris on February 23, 1798, to the same Directory, *"we shall not acquire superior force on the seas for several years yet. An invasion of England without having command of the sea is the most difficult operation which has ever been undertaken. It is only possible by surprising a passage, either evading the squadron blockading Brest or the Texel, or crossing at night in small boats and arriving somewhere in Kent or Sussex after a passage of seven or eight hours. To do this we need long nights and therefore winter. April past, it is no longer possible to do anything. Any operation which might be attempted with boats during the summer, to take advantage of calms, would be impracticable, because the enemy would offer insurmountable obstacles to a landing and above all to a passage. Our Navy is as little prepared to-day as when the army of England was created, four months ago . . . . If, in view of the actual condition of our Navy, it is thought impossible to secure the prompt action which circumstances require, we must then give up all idea of an English*

expedition, and be satisfied, while continuing to threaten one, to fix our whole attention, and direct all our resources, upon the Rhine, in order to try to snatch Hannover and Hamburg from England—or even to make an expedition into the East which might endanger the commerce of India. And, if none of these three plans is possible, I see nothing else to be done except to make peace with England."

How then can it be pretended that, in preparing his plan of an invasion of England, Napoleon ignored its difficulties? The foregoing letter proves, on the contrary, that none of them escaped his notice. He lays down clearly, first of all the principle of command of the sea, a principle whose consequences are of incalculable importance to the student of the philosophy of naval history. Doubtless, despairing of being able to meet this requirement, he does seek to escape from it by proposing a possible surprise; but in his case this is rather a consequence of his fixed idea, the destruction of the English power. Nurtured upon the study of Hannibal's method, he too wished to strike at the heart of his enemy, by attacking him on his own hearth, at the very source of his life. But if, for a moment, yielding to his impatience to obtain results, he cherishes the chimerical plan of violating the true principles of war and avoiding battle, when, a little later, the time for action comes, he returns of his own accord to the application of the principles which he, more than anyone else, has helped to make universally accepted.

The proof may be found in a note from Napoleon to the Minister of Marine, dated September, 1805.

"What was my intention in creating the flotilla of Boulogne? I intended to assemble forty or fifty war ships in the harbor of Martinique by combined movements from Toulon, Cadiz, Ferrol and Brest; to have them return suddenly to Boulogne; to find myself master of the sea for a fortnight; to have one hundred and fifty thousand men and ten thousand horses encamped on this coast, a flotilla of three or four thousand boats, and, when the arrival of my fleet was signalled, to land in England and seize London and Trinity House. This plan just missed success. If Admiral Villeneuve, instead of entering Ferrol, had been satisfied to unite with the Spanish squadron, and had then made sail for Brest to join forces with Admiral Ganteaume, my army would have landed and it would have been all up with England.

"To make this project succeed, it was necessary to assemble one hundred and fifty thousand men at Boulogne, to have four thousand boats there and an immense quantity of stores, to embark all these, and yet to keep the enemy from suspecting my plans. I owe my success in this to my doing the opposite of what it seemed necessary for me to do. If fifty ships of the line were to come to protect the army's passage to England, transports alone were needed at Boulogne, and the profusion of galleys, gunboats, flatboats, shallops, etc., all armed vessels, was quite useless. If I had thus assembled four thousand vessels of transport, the enemy would without any doubt have seen that I expected my squadron to be present before attempting the passage. But by constructing galleys and gunboats, by arming all these vessels, I opposed cannon to cannon, war vessel to war vessel, and the enemy was deceived.

"He believed that I intended to force a passage by the sole use of the military strength of the flotilla. The idea of my true plan did not occur to him at all, and when, the movements of my squadrons having failed, he perceived the danger he had run, fear fell upon the councils of London, and all intelligent people admitted that never had England been so near to destruction."

The quotation, as may be seen, is well worth being given in full, for it is an example of magnificent strategy; its principles are faultless, and this gigantic plan might and ought to have succeeded. The necessity of command of the sea is set forth this time precisely and clearly. It is to obtain it, which can only be by actually having superior forces at the selected point, that he directed his squadrons for a time to avoid action, in order to bring about their concentration prior to the decisive operation.

Another advantage of this combination was that it divided the English naval forces sent forth in pursuit of different French squadrons of whose destination they were ignorant, and thus doubly inclined the balance of power to the side of France. This plan of operation also drew strength from its distinctly offensive character, and from the many advantages assured to the one of two adversaries who knows what he wants and whither he goes.

It suffices to call to mind the events of this year 1805, so justly celebrated in naval annals, to be sure that the Emperor was under no delusion when he hoped to keep his true design hidden from his enemies. Among the proofs of this there is none more decisive than the furious pursuit of Villeneuve's squadron by Nelson.

Would the illustrious English admiral have sought for traces of his enemy first upon the coasts of Africa, then in the Antilles, if he had so much as suspected his real destination? His letter to the Admiralty, after Villeneuve's first sortie, leaves no doubt as to his ignorance of the intentions of his adversary. *"Of two things one must be true,"* wrote he, *"either this squadron has returned to port disabled, or it has held its course to the East, and probably towards Egypt."*

The incident of the brig *Curieux* meeting by chance the squadron of Villeneuve at sea and on her arrival in England causing, by the sensational news which she brought, important changes in the distribution of the English forces, ordered at once by the Admiralty, is further evidence.

Napoleon's strategic plan, then, was perfectly conceived; I have said that it ought to have succeeded, and, in fact, if the success did not equal the ingenuity of the combination, there are many causes worth examination to which it may be imputed.

In reality, although unaltered in its main features, this plan under pressure of circumstances undergoes some modifications in detail, at least during the time of its execution.

At the beginning the principal rôle fell to Latouche-Tréville, who was equal to it; this flag officer was to set sail from Toulon with his ten ships, to join to them at Cadiz the ship *Aigle,* to free from the blockade before Rochefort the five ships assembled there, and to enter the channel with these sixteen ships while Ganteaume held Cornwallis before Brest. The English at this moment had only seven or eight ships in the channel to oppose to this French naval force, their squadron of the Texel being unavailable on account of the necessity of blockading the Dutch squadron.

The concentration of superior forces in the channel was then not only possible, but probable; the death of Latouche-Tréville took from this plan its greatest chance of success.

Napoleon then changed the details of execution of his plan and conceived the ingenious scheme of concentrating his squadron in the Antilles, Villeneuve was to sail from Toulon, this time to make a junction with the Spanish Admiral Gravina, and to steer for America. Missiessy and Ganteaume had been instructed to proceed to the same destination, the first starting from Rochefort and the second from Brest. Why this concentration could not be effected is known. On the one hand, Villeneuve, after a first un-

fortunate sortie on January 18, had been obliged to delay his departure for two months in order to repair the damages done to his ships by storms, so that, when he reached the Antilles, Missiessy, recalled to Europe, had already gone. On the other hand, Ganteaume had been unable to find a single favorable occasion for breaking Cornwallis' strict blockade.

And yet, the master thought which directed the plan still retained all its value. In default of the reunion of all the French forces prior to any operation, numerical superiority, the end aimed at, could still be obtained. Villeneuve, setting out from the Antilles in his turn, was ordered to return to Ferrol, to take the fifteen ships which were to be there, and to proceed to Brest with a fleet then composed of thirty-five ships.

Cornwallis' fleet comprising but eighteen ships, the certain cooperation of Ganteaume in the attempt to break the blockade, gave to the French-Spanish forces a superiority so crushing as to enable them to count upon success. The entry into the channel of the fifty-five ships thus united was awaited by the Emperor with feverish impatience. The success of this strategic plan was probable this time again because the English continued unsuspicious of the exact objective at which he aimed. Even after the indecisive battle of Cape Finisterre, even after the delays at Vigo and Coruna, Napoleon's strategic concept retained its high value. "*Set forth,*" he wrote Villeneuve, "*your passage by itself alone makes us with certainty masters of England.*"

At that very moment Villeneuve could still make a junction with Allemand, Missiessy's successor in command of the Rochefort division, descend upon Brest with thirty-three ships, and beat Cornwallis, who had but eighteen. And to do so, the French commander-in-chief need only have had a tithe of that wonderful military judgment of his emperor, or indeed of Nelson, which urged those two great warriors to seek battle instead of avoiding it, to risk a few cards to win the game. We well know how on the contrary this game was irretrievably lost by Villeneuve's timidity and his retreat to Cadiz.

This study of Napoleon's strategy is an admirable lesson in affairs and furnishes matter for very valuable instruction from which at the present time we can derive benefit.

Thus, behold a remarkable plan of operations, conceived in accordance with the best principles of war, by a man of genius for

whom strategy has no secrets, and the execution of which is favored by the ignorance of adversaries who have failed to understand it. And yet it ends in a complete failure, and, still worse, in disaster.

This fact, inexplicable in the eyes of the uninstructed, results from causes, many in appearance, but really included in one single error committed by the emperor, and due to his ignorance of maritime affairs.

Without any doubt he lacked "the seaman" of the situation, capable of comprehending his views, of perceiving their greatness and assimilating them to the point of making them his own, a man sufficiently imbued with the true principles of warfare to assure success in their execution.

All the French admirals of the time were, without exception, second rate men, and the great master could not be near them to inspire them with his own ardor as he did in the case of his lieutenants in his campaigns on land.

"*The great weakness of our navy,*" he himself wrote to Lauriston on February 1, 1805, "*is that the men who command it are inexperienced in all the hazards of command.*"

But the absence of a faithful and intelligent interpreter of his military ideas is not enough to explain so great a failure. In his hour of exile, when Napoleon scrutinized his glorious past and sought the reason for the happenings of his reign, he made his full views known in the following statement which I have taken from the Mémorial de Sainte Hélène: "*I looked unceasingly for the right naval officer without being able to find him. In that profession there is a speciality, a technicality, which put a limit to all my conceptions. No sooner did I propose a new idea than I had Ganteaume and the Navy Department on my back. 'Sire, that is impossible. And why? Sire, the winds do not permit of it; and then the calms, the currents,' and I was stopped short.*

"*If, instead of having to combat obstacles, I had met some one who agreed with me and furthered my views, what results might we not have obtained? But, during my reign, there never appeared in the Navy a single man who deviated from routine and knew how to originate.*"

Yes, it is very certain, he always lacked the true seaman, the necessary man of action, and this waste of energy upon the ordinary and inevitable difficulties of the profession, which a great

chief must accept as the consequence of the inseparable circumstances of this calling, superabundantly reveals it.

But there was something else. The letters in which the unfortunate Villeneuve complained of the deplorable condition of his squadron were not wholly the lamentations of a timid mind which responsibility crushes. It is only too certain that the crews were incomplete, that for want of money they lacked stores of the most urgent necessity, that the ships themselves were badly armed and badly equipped.

After the futile sortie of January 18, 1805, Villeneuve wrote: "*Ships thus equipped, ill manned, encumbered with troops, having rigging which is old and of bad quality, which, with the least wind, carry away their masts and tear their sails, which, in fine weather, spend the time in repairing the damages done by the wind, by the feebleness or the inexperience of their sailors; such ships, I say, are unfit for any undertaking.*" And, at the end of the campaign, he wrote again from Coruna, "*Never did such miserable ships put to sea. That is the primary cause of all our misfortunes.*"

And it is scarcely necessary to characterize the Spanish fleet, composed of "*the poorest ships that ever were sent to sea,*" and so well known to be such that Nelson, in a famous act of bravado ordered each of his captains to attack a French ship and took upon himself alone the charge of all the Spanish vessels.

The real error of Napoleon, then, was believing that great designs could be accomplished with so poor a naval instrument. Accustomed to improvise armies, to recruit heterogeneous bodies of men whom he galvanized by the all powerful influence of his command, he always fancied that the same would do in the navy.

On May 9, 1798, he directed the commandant at Toulon to supply the deficiency of sailors by putting on board the vessels of the fleet what remained of the sixth half brigade of artillery. On June 16 of the same year, he likewise embarked five hundred Turkish slaves at Malta for service in the fleet. He never really understood the quite peculiar needs of a great navy, the wise and methodical preparation, an important work absolutely requiring time, which is needed to bring the personnel and material of a fleet to the point of being ready to fight. It is possible to imagine an army composed of recruits hastily levied and combined, and to admit that under the impulse of an inspired general, it may do great things. A navy cannot be improvised; the mere habituation

to the abnormal medium in which it moves, the struggle against the fierce elements, which singularly complicates that against men, themselves demand a special and lengthy education of those who compose it. And this is still more true now when more complicated ships, filled with machinery, have pressing need of a trained personnel.

It was very far from rigorously correct, then, to trust the success of Napoleon's strategic plan to a simple arithmetical comparison. Really, the idea of "superiority of forces" in war is very far from being so simple a matter. And it is by no means certain that the fifty or fifty-five French and Spanish ships, had they succeeded in getting together, would have beaten the eighteen or twenty admirably prepared English ships which guarded the channel.

Nelson had but ten ships, Villeneuve had eighteen, and yet the former did not hesitate for a moment to pursue the latter to fight him. He knew his adversary and was sure that the superior worth of his own forces, moral and material, would more than compensate for his numerical inferiority. All these factors have weight in the true balance of forces.

The strategical lesson we have just learned is too important to us, even in its exposition of errors committed, for me not to anticipate a possible objection based upon a legend originated in the camp at Boulogne and tending to show that Napoleon's preparation was a mere feint. The emperor himself did justice to this story in his *Mémoires:* "*The invasion of England has always been thought possible, and the landing once effected, the capture of London was inevitable. Master of London, a very powerful party would have risen against the oligarchy. Did Hannibal crossing the Alps, or Cæsar landing in Epirus or Africa, look backward? London is but a little way from Calais; and the English army, scattered for the defence of the coast, would not be concentrated in time, the landing once accomplished. Doubtless this expedition could not have been made with one army corps; but it was sure with one hundred and sixty thousand men, who would have been at London's gates five days after their disembarkation. The flotillas were merely intended to land these one hundred and sixty thousand men, and to get possession of all the shallow places. The passage was to have been made under the protection of a squadron assembled at Martinique and coming*

thence under a press of sail to Boulogne; if this plan of assembling the squadron failed one year, it would succeed another time. Fifty ships setting out from Toulon, from Brest, from Rochefort, from Lorient and from Cadiz, meeting at Martinique, could appear off Boulogne and assure the landing in England while the English squadrons were sailing the seas to cover the two Indies."

Napoleon has made his conception still clearer in the following declarations, found in the Mémorial de Sainte-Hélène: *"Some thought my invasion was a foolish threat, because they saw no reasonable means of attempting it; but I had set about it from far off, and operated without being seen. I had scattered all our ships; the English had to follow them over the world; but ours had the single object of coming back unexpectedly, all together, to meet in one body on our coast. I was to have seventy or eighty French or Spanish ships in the channel; I had reckoned that I should remain* THE MASTER DURING TWO MONTHS. *I had three or four thousand small vessels which only awaited the signal; my hundred thousand men every day went through the exercise of embarking and disembarking, like all the other drills; they were zealous and willing . . . ."*

I have purposely underlined certain words of this statement, because they show the evolution which had taken place in the Emperor's mind since June 9, 1805, when he wrote in these terms: *"I really do not know what sort of precaution England can take to shelter herself from the terrible risk she is in. A nation is very foolish, when she has no fortifications and no army, to expose herself to the chance of having an army of one hundred thousand picked men and veterans descend upon her. That is what the flotilla is really for; it costs money, but it is only necessary to be* MASTER OF THE SEA FOR SIX HOURS *that England may cease to live."*

The comparison of the underlined words in the two quotations indicates the evolution I just spoke of. When he wrote the earlier, Napoleon was under the dominating impression of his hot fight with his implacable enemy; the desire to reach her at any cost, the impatience to strike to her heart, obscured his judgment, and so much the more so that his ignorance of the essential needs of preparation for naval war concealed from him the real difficulties of his undertaking.

How otherwise can we explain his astonishment and disdain of

a people who, contrary to the established rules, pretended to defend itself by other means than troops and fortifications?

It must not be forgotten, in fact, that this same man had taught, better than anyone else, to a conquered world, that the best of all defences for a nation was the vigorous attack of victorious armies.

Later, on the rock of Saint Helena, reviewing his whole life and pondering the lessons of experience, he had had, on the contrary, the clear vision of the great primary rôle which freedom of the seas plays in naval operations; he had thus understood that on the sea, as well as on land, the protection of *acting forces* is the best of all, and that on this point there is real unity of military concept.

It is not during a few hours only that it would have been necessary to be master of the sea, nor even during a few weeks; it was necessary to conquer this command of the sea definitely, by the energetic action of a powerful fleet, superior in moral and material force to that of England. This result accomplished would have made any landing in England useless, for the government of that country would have humbly sued for peace.

It is altogether interesting to observe, in ending, that Napoleon, great admirer of Hannibal, imbued with the military ideas of the Carthaginian general, was like him to succumb from lack of naval forces, and to lose the empire of the world because he had lost that of the seas.

Waterloo was but the coup de grâce; Trafalgar was really the mortal wound.

CHAPTER II.

An Historical Study of the Strategy and Tactics of Duquesne, Tourville, Suffren and Nelson.

In the preceding chapter we sought, in the history of great military wars, the principles which generals have obeyed in the pursuit of success; we now take up a similar study for naval wars, and it would be superfluous to enlarge upon the exceptional interest of the latter to naval officers.

The interest will be so much the more engrossing as we shall draw our documents from original sources, and shall take their thoughts from the very lips of famous seamen.

Assuming once more that the *facts* of history are known to all of us, I shall limit myself to recalling that, although the history of the French navy registers many reverses, it also contains many glorious pages. Victories and defeats alike will serve to bring out precious lessons in military precepts.

DUQUESNE.

In a letter from the celebrated Duquesne to M. de Vivonne, that great seaman develops his views upon war with a conciseness which makes them worthy of reproduction. Charged with carrying to Messina, with a squadron of twenty-four ships, troops to re-enforce M. de Vivonne, Duquesne had brought his fleet to the south of Italy, when, on August 13, 1676, the lookouts reported a number of sails which, on getting nearer, were recognized to be those of the Dutch squadron, also of twenty-four ships. Duquesne at once prepared for combat, but, favored by night, the enemy's fleet disappeared.

In the letter referred to, Duquesne thus expresses himself: "*They planned to avoid us; nevertheless, had I not been burdened with this infantry, of whom a large number are taken sick every day, and with this convoy of provisions for the galleys, I would have followed and looked everywhere for that fleet until I came up with it or drove it from the seas. It being an important consideration to save this infantry, who would destroy our crews by the*

dysentery and bloody flux which are among them, and to prevent our being obliged within a few days to abandon the sea for lack of water, I thereupon assembled the general officers and decided that we would take advantage of the wind to reach the light house, send the convoy in and land the infantry there . . . . and in the meantime that the fleet shall keep under sail or at anchor, in order afterwards, if you approve of it, immediately to put to sea and catch up with that fleet of the enemy, to fight them or drive them wholly from these seas, according to the orders of His Majesty."

Thus we have it precise and clear. Despite the unfavorable conditions resulting from the use of his ships as transports—and we know that, too often alas, the exclusively fighting rôle of a naval force has been ignored—the great seaman does not hesitate to seek battle. He feels that no more certain method of fulfilling his mission exists than to destroy the hostile naval force. And when circumstances independent of his will have lost him the opportunity, he wishes, like the great warrior that he is, to seize upon it again and, dropping everything else, to hasten in search of the Dutch squadron to destroy it. That was the principal objective.

The battles of Stromboli and of Agosta, against an adversary in all respects worthy of him, Ruyter, had already shown Duquesne's exceptional worth and how well he understood war.

Thus, as his faithful historian Jal very judiciously observes, Duquesne disapproved of homœopathic doses, of operations timidly prepared with insufficient means. He wished *"strong squadrons, serious demonstrations, enterprises greatly conceived and carried out with the energy which facilitates and assures success."*

In the struggle against the Barbary States, he advised the substitution for small armaments of others capable, by the fear they would inspire or by the force they could display, of forcing the Moors to respect treaties. He had a clear understanding of the fact that the idea of force dominates the entire philosophy of war; it is its reason, its object and its success.

In a letter written from Messina to Colbert, on May 7, 1676, the Chevalier de Tourville paid a notable compliment to Duquesne in these terms: *"I must tell you, though as regards my own affairs I complain of no one, that there are pests in this corps who turn every thing upside down, and who are such great blunderers that*

if we pay any attention to them we shall find the best acts of M. de Quesne, and those of the greater part of the navy, will come to nothing at a time when he is doing extraordinary deeds for the King's service."

In another letter of August 26 of the same year, also addressed to Colbert, the same Tourville says again: "*You will have learned that we have been unfortunate, that fourteen Dutch ships escaped from our hands by fleeing without pause. M. du Quesne took every imaginable care and missed doing nothing which could possibly be done in order to catch them, but their good luck saved them during the night without our being able to get near enough to observe them, although M. du Quesne stood for them under a press of sail. If we had not been burdened with troops, and most of the ships wanting water, M. du Quesne would have been seeking them everywhere.*"

TOURVILLE.

No one could be better fitted than Tourville to express an appreciation of a great captain like Duquesne, whom he saw at work and under whose orders he served. Perhaps no admiral ever had to a higher degree than himself the profound perception of the rules of war and of the necessity of destroying the principal forces of the adversary in order to fully accomplish the objects of a war.

The study of Tourville's campaigns is particularly profitable and interesting on this account; it justifies the important place we are going to give him, and the more so because his very active correspondence, still in existence, lets us learn all his strategic ideas; it is, consequently, a real lesson in affairs.

Tourville had the exceptional good fortune to unite in himself almost all the qualities of a great seaman; sea knowledge, quick perception, coolness, judgment, intuition of the right thing to do, profound sense of opportunities, etc., not to speak of native courage. He gave the measure of these remarkable gifts when, in 1689, setting out from Toulon with a fleet of twenty vessels, he brought about its junction at Brest with the fleet of Chateau-Renaud, in spite of the blockade of that port by the English forces.

The immense superiority of the latter, who mustered seventy sails, made any plan of forcing a passage impossible; on the other hand, a junction with Chateau-Renaud's squadron alone could re-

establish the balance of forces. Tourville solved this difficult problem by his skillful seamanship. Counting on its being impossible for a blockading squadron to hold on at sea off the island of Ouessant with wind from the southwest, he waited patiently, standing back and forth off that island, notwithstanding the fatigues of a passage already long, with badly armed and scantily provisioned ships, until the wind came out as he wished. After six days' waiting, the breeze settled at southwest. Tourville immediately stood for the Iroise passage and entered Brest with a fair wind under the very eyes of the English squadron well to leeward. A complete success thus crowned his intelligent previsions. Objection might be made to this interesting example of military synthesis on the ground that the conditions of modern naval wars are quite different, and that steamships are no longer dependent upon the wind. I do not deny it; but however powerful the machinery of modern battle ships, there will always be conditions of the sea in which they will not be sufficiently so to overcome all difficulties. After a heavy blow from the southwest, such as frequently occur on the coast of Brittany for example, we can foresee that the circle of a naval force blockading Brest would be very considerably opened out; an energetic and resolute chief will know as well to-day as in Tourville's time how to profit by the aid of the elements under similar circumstances. The example, therefore, has in no way lost its value.

The best known, because in common eyes apparently the most brilliant, episode of Tourville's military career, is the naval victory of Beachy Head, won over the English-Dutch fleet commanded by Torrington.

Tourville had the advantage of numbers, seventy ships against fifty, but was to leeward, an unfavorable position which, during the fortnight's pursuit of the allied fleet, had as yet given him no opportunity of engaging it. The day of the battle, Torrington having decided to bear down upon the French squadron, it became possible to fight. In spite of the loss of six Dutch ships, the action might seem to have been indecisive, since the two fleets, English and French, separated without serious loss to either. But such was not the case, and we must modify this superficial view when we note, with Father Hoste, who was present by Tourville's side, that for a fortnight after this indecisive battle Tourville pursued the hostile forces with passionate ardor from anchorage to anchor-

age, and burned and drove on shore thirteen of their ships of the line. Do we not there see the certain proof of disorder spread through the English fleet, a consequence of their defeat? And should another proof be needed, the mere fact of the court-martial of Admiral Torrington in England would suffice to prove that the English people were far from satisfied with the results of the engagement.

However, this result in itself is of little importance to us; we find the outline of the true doctrine which we are looking for in a letter from Tourville to Seignelay, of July 13, 1690.

"*Since our fight,*" writes Tourville, "*we have not lost sight of the enemy, getting under weigh with every tide; but for the calms we would have had twelve or fourteen Dutch ships. Most of them being dismasted, they are the more easily towed by their boats; nevertheless the night of the 10th and 11th, they had to set fire to two of their ships, one a Dutch flagship of eighty guns and another of seventy guns. I detached some ships to follow a great Dutch three-decker which, having only a foremast, stood down the coast before the wind; I also sent others to try to catch six vessels which remained to leeward of the enemy's fleet; I am still pursuing them regardless of the fatigue of the men and of the weakened condition of our own masts. Like us they take advantage of the tides and of the wind, which has all along been favorable to their drawing close in to the dunes; I am persuaded that if I had been to windward of them after the fight, I should have wholly destroyed them.*"

Here we find a doctrine which begins to be familiar to us, and to stand forth from the study of the wars of the past with the force of a principle. Like Duquesne, Tourville regarded the destruction of the enemy's forces as a necessity, and having laid this down as his objective, he pursued its realization with his whole energy and with all his resources. He could not be content with an incomplete success, and used all the ardor and activity necessary to make it decisive in harassing the enemy without a moment's respite. Nothing but the circumstances of unfavorable weather could snatch from him the complete victory he sought; he had done everything to obtain it.

If Tourville's strategy can justly be considered a model, it is because, in the very circumstances where he himself knew defeat, it was precisely owing to his unwillingness to follow the counsels

of his own genius and experience; and it is also because of having imposed upon him absurd plans that the government of France was beaten.

By an order dated May 26, 1691, Tourville was instructed to set sail with his squadron and to cruise at the mouth of the Channel with a view to the capture of a rich Dutch-English convoy from Smyrna. The principal objective imperatively assigned to Tourville by these orders was the capture of this convoy, for, according to their words: *"His Majesty graciously informed him that the service he would render by the capture of this fleet, which is worth thirty millions, would be more important for the execution of his Majesty's designs than if he should win a second victory over the enemy's naval forces."*

The poverty of this conception confounds us. Supposing that it was possible, would not the destruction of the hostile naval forces plainly have made the capture of the convoy, thenceforth defenceless, more certain than an attempt to surprise it possibly could?

To still further specify the unfortunate ideas of the naval authorities and to narrow still further the bounds set to Tourville's spirit, the order contained the following directions:

"Should the enemy go out of the Channel and should they be in superior numbers, His Majesty forbids his attacking them; he orders him, on the contrary, to avoid them, sparing as far as possible the reputation of his fleet, and taking advantage of any favorable opportunities which his capacity and experience may bring about, it being certain that there can be such conditions at sea as will cause the lesser number to become superior to the greater."

I refrain from formulating any opinion on this dictum; for Tourville took it upon himself to do so in a masterly manner in a marginal note, written by his own hand beneath the above quoted instructions.

"We should be informed," says he, *"as to the number and strength of the war vessels in the enemy's fleet; we need not hesitate to attack them if their forces are only greater than ours by a small number of ships, six, seven or even eight. As I have already had the honor to say to the king, from the moment that two fleets are in sight of one another, so as to be able to recognize each other, it is impossible to avoid a fight. Should one hostile fleet, being to windward, wish to engage the other, at a season when the*

night is only three or four hours long and no sudden storm will occur to facilitate escape, the latter would have nothing to do but abandon all his ships except the very fast ones, a procedure quite inadmissible because it would demoralize the crews to such an extent as to make it very difficult to reassure them when it became necessary to fight; All flag officers and those who have sea experience will accept this as a fact, and that the better part (although inferior) is to await the enemy in good order and with firm countenance."

"Only people who have no knowledge of the profession," he further says, *"can suppose that two fleets, during a campaign, can be in sight of one another without engaging, unless they so wish, and if any dare to maintain such a view, I think them very presumptuous and that they greatly compromise the king's service."*

These few lines contain some of the essential elements of an entire doctrine of naval war: the primary importance of the battle; the impossibility of refusing it when one of two squadrons in sight of one another seeks it, the necessity of securing a homogeneous force by grouping together ships of the same speed, the influence of the moral factor upon the personnel, etc.; all these measure the chasm which separates the bureaucratic conception of war, which prescribes the avoidance of battle, from that wholly military one which, the contrary, faces it as the ultimate aim.

Let us be very clear on this point, for though Tourville's note might seem to make further emphasis unnecessary, we must avoid even the possibility of a misunderstanding on this subject.

To seek action, as the illustrious seaman explicitly states, does not at all mean to engage blindly, in any case, whatever the circumstances or the relative strength of the opposing forces. It was precisely because he fully understood the impossibility of holding his own with fifty-five ships against the ninety of the English fleet that he tried to make plain the inanity of this idea of capturing a convoy without running the risk of battle. For the same reason, when urged to order all his forces to put into Belle Isle, he vehemently objected. That place seemed to him badly chosen for such an assemblage: *"It is of the greatest importance that the entire fleet be kept together when they put into port on account of the disadvantages which may result from a separation."*

Under such unfavorable conditions, only his consummate skill as a seaman enabled him to keep the sea for fifty days in that

immortal *deep sea* campaign and to bring his fleet back uninjured to Brest despite the pursuit and constant nearness of the enemy.

The narrow and despicable object sought by Pontchartrain, the capture of the convoy from Smyrna, failed of accomplishment, as Tourville had predicted.

To the reproach of the head of the navy department on the subject of his putting in to Bertheaume after the campaign, though formally forbidden to do so, he replies: *"It would be much more agreeable to me to fight the enemy than to avoid him, which latter course has not a few difficulties."* And again he says: *"To be able to prevent a hostile fleet from accomplishing its purpose, we must be in condition to follow without losing sight of it and to fight it."*

Events were close at hand which would show how entirely the naval administration of 1692 misconceived the admirable war instrument which it possessed in Tourville. How could it be otherwise when the destinies of the navy were confined to a man like Pontchartrain, who joined with Louvois in proposing to the king to replace this navy *which cost too much and was good for nothing but defending the coast* by troops. Such ideas, as false as fatal, explain the naval disasters which were their natural outcome.

New instructions announced to Tourville what was expected of him. The matter under consideration was one of those numerous plans for an invasion of England which mark the history of the French-English wars and of which the result was always negative, because the conditions which, before any trial, made them chimerical were never recognized.

His orders directed him to set sail from Brest *even should he have information that the enemy was outside with a greater number of ships than those which were capable of following him;* they added that in the case of a meeting an imperative order was given to him to engage them *no matter what their numbers.* It is best to quote the text of what followed: *"If when he has conducted his ships to the place of landing or when it has begun, the enemy comes to attack him with a greater number of vessels than are under his command, His Majesty directs him to fight them and to persist in fighting, so that, even should he be worsted, the enemy may not be able to prevent finishing the landing."*

One need not be greatly learned in naval matters to perceive all the folly and impotence of these strange ideas. Those who

assumed to order battle under conditions of immense inferiority had scarcely any conception of what *force* means. Nor had they any understanding of naval war when they evoked the possibility of finishing the operations of a disembarkation under the fire of an enemy of superior strength. What the logical result of this governmental anarchy was is well known; the disaster of La Hogue, when Tourville saved at least the honor of the French navy, despite the extraordinary disproportion of the opposing fleets, forty-four French vessels against ninety English-Dutch.

But a new and very instructive lesson is to be drawn from these events; it is the disastrous influence upon the results of a war campaign exercised by the remote, narrow and vexatious action of an ignorant and altogether incompetent administration.

As Tourville himself said: *"I beg you to believe that none wishes more than I to accomplish something, but my professional knowledge has compelled me to take precautions, and I have always noticed that officers who in Paris arranged the finest enterprises in the world became of quite a different opinion when here."*

The restrictions placed upon the military operations of great leaders by too strict instructions, most often formulated without knowledge of technical or fortuitous necessities, have never led, so far as I know, to fortunate results. The history of the wars of all times and all countries furnishes, on the contrary, numerous examples of the unhappy part played in final failure by the untimely interference of the controlling powers in the operations in the field.

The Spanish-American war, that which recently took place in the far East, without counting many others, will allow us to sustain this conclusion.

This would be the proper place to discuss the American War of Independence, interesting in so many respects; but I think it more profitable to postpone its examination to the chapter on authors, when we shall set forth Captain Mahan's theories.

SUFFREN.

The transition from Tourville to Suffren is quite natural: the two great seamen really based their strategy on almost identical rules, deriving always from the same principles, for it was above all by the incomparable flashes of genius of his strategy that Suffren has made his name famous in all the navies of the world

and has left to us, French naval officers, imperishable memories. It is not unnecessary to insist upon this important point, for in a book on naval strategy, which I should not mention were it not by a former naval officer, this astonishing opinion may be read: "*Suffren was above all a tactician!!!*" Such a remarkable conclusion can only be explained by a complete misunderstanding of history or by a much too superficial interpretation of facts.

If Suffren was actually ahead of his times in tactics; if he blazed the way in which Nelson, following him, found on the field of battle his most glorious successes, as we shall soon see in detail, we must repeat that it is above all by his magnificent conception of the art of high war that he became immortal.

Even before an important command had permitted him to display the full measure of his military genius, he had shown on many occasions how well he understood war, and his *method*, as we are about to demonstrate, resembles that which is already familiar to us.

In 1778, as captain of a ship in d'Estaing's squadron, he spent the whole time of that campaign in America, in chafing like a blooded horse under the direction of an incapable hand. The many echos of his discontent may be found in his correspondence.

During the expedition against Saint Lucia, the English Admiral Barrington is surprised at anchor with seven ships; d'Estaing could easily have finished him, for he had twelve. But he preferred to attempt a landing, which failed; yet Suffren had written to him on this occasion: "*Let us destroy this squadron; their army, ill supplied, in a difficult country, would surely be forced to surrender; let Byron come afterwards, he will then be welcome.*"

And thereupon appears, with startling clearness, the superiority of this conception of war, which fixes as its principal objective the destruction of the naval forces of the enemy. In this example of Saint Lucia, was it not absolutely sure that, Barrington's fleet once annihilated, nothing could relieve the island from the necessity of surrender, in the absence of any possible help? Better still, after Barrington's defeat, the French fleet could and must have conquered that of Byron; it would then have been mistress of the sea. Having failed to prevent the junction of the two English admirals, it let slip the victory which was in its grasp. The precise significance of *superior forces* is here exemplified, and the lesson to be learned is that in war it is not necessary to try to have

absolute superiority all the time and everywhere. Such an endeavor would usually be in vain; but from the classic fight of the Horatii and the Curiatii till now, it is relative superiority, at one place and under fixed conditions, that it is important to secure. If d'Estaing had understood this he would have beaten the English in detail, Byron after Barrington, despite his inferiority relative to their joint forces. As for Suffren, he understood it, and already he was giving proof of the marvelous intuition in matters of war which was to immortalize his name and the campaign of India.

"*Our campaign has been a succession of vicissitudes, of good fortune, of evil fortune, and of follies,*" he wrote after the Saint Lucia affair, where his counsels had been so little attended to, "*During my thirty-five years of service I have seen many acts of folly, but never so great a concourse of them . . . . the foolish manœuvers that have been made, the silly and treacherous counsels that have been given, could hardly be imagined. Finally, I have fallen into disfavor for advising the attack of seven small ships with twelve big ones, because some of them were defended by some shore batteries.*"

After the junction of the two English squadrons, which it had not depended upon him to prevent, he wrote further: "*What is very much to be wished is that all this should be finished. A campaign a year long is very tiresome, especially when, having had ten chances to accomplish great things, we have done only what is foolish . . . . I am full of disgust . . . .*"

In another letter he also said: "*Otherwise led, we would have been loaded with glory and riches, but we shall get neither one nor the other . . . .*"

The opportunity was close at hand for this ardent and energetic nature to show the full scope of its military worth.

Two years later he sailed from Brest, with six ships and eight transports under his command, commissioned to proceed to the Cape of Good Hope, to there disembark the troops and prevent the occupation of that Dutch colony by the fleet of Commodore Johnston, sent there by England.

At the very beginning of this campaign, a war problem of the greatest importance presented itself without warning to Suffren; I refer to the incident known as the battle of Porto Praya. The adversary whom he expected to find south of Africa unexpectedly appeared before him, and he had to choose between two courses:

either to take advantage of his momentary delay at anchor by proceeding with all haste and reaching the destination before him, or to attack and endeavor to destroy him.

For a man like Suffren, the choice could not be doubtful; since the only possible obstacle to the accomplishment of his mission was Johnston's squadron, the plan of suppressing that obstacle could not but enforce itself upon his mind.

The occasion was truly too favorable not to be seized, and that is why Suffren attacked. He even attacked with a little too much impetuosity, and if the strategical conception is without flaw, his tactical plan is far from meriting such praise. His orders, ill understood or badly executed by his captains, did not allow him to derive from the battle all the profit he had a right to expect. But, though the English squadron was not annihilated, it was at least sufficiently injured no longer to be in condition to proceed to the Cape until after serious repairs. Suffren's mission was then successfully accomplished, and that is the really important matter.

But this incomplete result could not measure up to the genius of Suffren. "*Porto Praya could and should have immortalized me,*" he wrote; "*I have missed, or have been made to miss, a unique chance. With my five ships I was able to make peace, and a glorious peace. But it was not so; that battle is of those which decide nothing, which are soon forgotten.*"

This letter tells more than many facts how Suffren understood war; in another he added: "*I have missed a chance to do great things with small means; I am inconsolable.*" Later on he was greatly to rehabilitate himself.

Thus, from the very beginning of his career as a military commander, his conception of war appears clearly and can be summed up in a brief formula: to consider the fleets of the enemy as the principal force which must be destroyed and reduced to impotence in order the more surely to accomplish the object of the war.

His wonderful Indian campaign afforded him means of applying his formula and of bringing out all its remarkable value.

To understand the full importance of the admirable lesson in naval matters which Suffren has bequeathed for our meditation, it is indispensable to make a rapid survey of all the difficulties with which he had to grapple.

Set forth from the Isle of France with his fleet, to carry on war on a coast wholly in possession of the English, he had at his dispo-

sition neither a harbor, nor a place of shelter against bad weather, nor any base of operations where he could repair or revictual.

And yet he did not hesitate, despite these unfavorable conditions, to push resolutely in pursuit of the English fleet under Hughes.

Sadras, Providien, Negapatam, Trincomalee, and Cuddalore, so many desperate and glorious combats, are the landmarks of a memorable campaign, infinitely more fruitful in the lessons of a wise system of war than in immediate results. Not one of these engagements was really decisive; but if Suffren did not succeed in satisfying his tenacious desire to ruin completely the English naval power in the Indian ocean, it was always the fault of his captains. It was this great seaman's fate never to have under his orders lieutenants capable of understanding his ideas, which were of too high an order for them, and which moreover shocked the timid traditions of the French navy of that period. He must have seemed, in their eyes, a sort of naval revolutionary.

Thus, in his correspondence, he gives vent, after each of his battles, to bitter complaints against his captains who, whether because they did not understand his orders or his signals, or because they wished to protest, in a truly unworthy manner, against the exceptional fatigues that their terrible chief imposed upon them, took but an indifferent and backward part in those battles.

His orders and his signals, nevertheless, deserved better; for in tactics, especially in its fundamental conceptions, Suffren was before all an originator and inaugurated the method of fighting which Nelson adopted and by which he obtained his greatest results. Until Suffren's time, in fact, battles were fought in what may be called the classic style, ship opposed to ship, in two parallel lines, and were nothing more than aggregations of duels.

Suffren overturns this tradition, pushing to its logical conclusion the profound sense which he has of the idea of *force*. He seeks to bring the whole strength of all his forces to bear together against only a portion of the enemy's fleet. Thereby he merely carries out upon the sea the principles already applied by great military leaders on the land.

The English historian Clerk wrote on this subject: "*M. Suffren not having had the hoped for success in the attack upon the rear of the British squadron the 17th February, his attempt upon*

the van, equally well concerted on this occasion, evidently proves him to be an officer of genius and great enterprise."

"If M. Suffren had wind enough first to bring down the van of his fleet to the attack of the British, and afterwards to bring up the rear division to support it, even within pistol shot of the British center; and if the ships in the British rear could not in time get up to annoy a crippled enemy, this the more particularly illustrates the propriety and practicability of bringing up and directing the whole, or any part of a force, against a smaller part of the force of an enemy; and that the effect ought to have important consequences, in battles at sea, as well as in battles at land."

It is true then that Suffren had the making of an incomparable tactician, because he felt the necessity of revolutionizing manœuvers which were too much regulated, too confined, but it is also exact to say that he was not complete as a tactician, whereas he will always be a model, without blemish, in the matter of strategy. He did not take enough account, in fact, of the inexperience of his captains, and he did not take enough care to make them understand his plans before battle. That alone explains the persistence with which those captains held back from full co-operation with him in all his battles, without exception, and thus compromised his success.

After having noted that Suffren's military genius lacked nothing in knowledge of principles, his unerring strategy above all demands our attention.

Among the deeds of that fine campaign of India, the taking of Trincomalee is particularly interesting. To be able to carry on a war to the death, the French fleet had to have what is nowadays called a "point d'appui," and has always been a base of operations. Profiting by the absence of the English fleet, which had taken shelter in Madras for repairs after the battle of Negapatam, while he did the same in the open roadstead of Cuddalore, and also speculating upon the advantage which the southwest monsoon gave him by putting his adversary to leeward, Suffren appeared before Trincomalee, disembarked his troops, and within six days, by the activity and vigor of his attack, as well as by the mildness of the terms he offered, brought about the surrender of the place. This activity and this suavity were explained by Suffren's feeling that such an enterprise could only be justified in a military sense on the strict condition of being carried on out of sight of a hostile

fleet. On the eighth day the latter actually appeared, but found the place taken. And this time once more the great French seaman had accomplished a masterpiece of war.

He had shown, on another occasion, to what an extent he realized the high responsibilities of a great military chief's mission. Called back, by instructions received from the minister, to the Isle of France, he did not hesitate to disregard them, for he would have considered it desertion to abandon a cruise which already had raised so high the prestige of French arms and shown to our enemies, as well to our allies in India, that there still existed a French navy.

This example of a courage unfortunately too rare, the *courage to assume responsibilities*, is worthy of much meditation; we must not be astonished at finding it in the great seaman we are discussing, for it has been one of the principal virtues of all the great warriors of all ages.

After the battle of Trincomalee, which followed the capture of that place, Suffren wrote to de Castries: *"I have just lost the chance of destroying the English squadron . . . . It is frightful to have been four times in a position to destroy the English squadron and that it still exists."*

These few words contain in condensed form the whole theory of war; for us they now no longer express new ideas. We shall come upon them again more than once.

Suffren, as well as others, understood the whole importance of speed, when in his letters he did not cease to advocate copper sheathing ships and also to complain of the lack of frigates which prevented his pursuing the enemy; nor did he deplore less the lack of homogeneousness of his squadron, made up of unlike unities, a capital defect which was the most frequent cause of his ships going into action in disorder.

The results of this marvelous campaign have been summed up in the inscription upon the pedestal of the statue erected to Suffren: *"The Cape protected, Trincomalee captured, Cuddalore delivered, India defended, six glorious battles."*

We seem to be dreaming, after that, when we recall that scarcely a few years ago a minister of marine, questioned as to the theories of war then favored by the Naval General Staff, replied: *"On no account will we recommence Suffren's campaign."* Which amounted to saying that we refused in advance to add another to

what is incontestably one of the most glorious pages of French naval history.

To keep the sea without let up, to winter on an inhospitable coast, to fall upon the naval enemy to fight him to a finish and destroy him, finally to win command of the sea, such were Suffren's deeds. Few laurels can be compared with his.

NELSON.

The distinction between Suffren and Nelson lies in the different instruments at their disposal and, to a notable degree, in their luck. While the former was the misunderstood leader of a poorly armed and badly trained fleet, and had at his disposal only precarious resources, and under his orders only mediocre and undisciplined officers; the latter had the good fortune to command homogeneous squadrons, wonderfully prepared by his predecessors, crews accustomed by very hard cruising to all the surprises of the sea, subordinates, all fine sailors, who could understand and assimilate all his war plans.

But if the instruments differ, the principles are identical, and the rules which both obeyed were in all respects comparable.

Even before he had assumed the heavy responsibilities of chief command, Nelson also had made known, on many occasions, how he understood war. After the naval battle of March 14, 1795, in the Gulf of Genoa, in which he had taken part under Admiral Hotham, convinced of the necessity of pursuing without rest the French squadron which, if not completely beaten, was at least demoralized as the result of an indecisive battle, Nelson went to see his chief to induce him to order the pursuit. The English admiral, satisfied with his partial success—with what he considered a good day's work—refused to consent to it. Regarding which Nelson wrote: *"Now, had we taken ten sail, and had allowed the eleventh to escape when it had been possible to have got at her, I could never have called it well done. In short, I wish to be an Admiral and in command of the English fleet; I should very soon either do much, or be ruined. My disposition cannot bear tame and slow measures. Sure I am, had I commanded our fleet on the 14th, that either the whole French fleet would have graced my triumph, or I should have been in a confounded scrape."*

These words are a veritable confession of faith on the part of the great leader, the exposition of a doctrine which he was later

on to apply with so great a mastery, and which he had drawn from the very sources of military history. They include moreover an idea which cannot be too much pondered, that is so say that war is not to be waged without risks. For what is war in reality, if not a game, the most terrible of all, since the stakes are human lives, the destinies of entire races? One might as well say that he would never take any chance when he gambled.

Activity was also Nelson's chief characteristic: *"Time is our best ally, and I hope we shall not soon give her up, as all our allies have given us up. Time is everything; five minutes makes the difference between victory and defeat."*

He had also to the highest degree the courage to assume responsibilities. Who does not know of his celebrated act of disobedience to Admiral Parker's signals at Copenhagen? If he had obeyed those orders, which directed him to cease firing and withdraw, he would certainly have endangered his squadron, forced to pass through a narrow channel under the fire of the coast batteries. The intuition of his military genius must then have enjoined upon him as a necessity what, taken in its narrowest sense, was an infraction of discipline.

But it is above all in his operations against the French fleets that his deeds of war shine most brightly.

In the first phase of this naval struggle, in furious chase after the French squadron which carried Bonaparte and his fortunes to Egypt, he reaches Alexandria before it, puts to sea again at once, in the belief that he is on the wrong scent, cruises back and forth in the Mediterranean and finally meets it at Aboukir, where he destroys it.

Vainly would one seek in naval history for a more striking example of the importance of speed in the pursuit of an objective, and, in Nelson's eyes, all other considerations were secondary and lost sight of in comparison with this objective. To ruin the French naval power and strangle at their birth the projects of Bonaparte, one measure only seemed to him efficacious, and that was the annihilation of the fleet. And in his tenacious purpose to attain this object there is to be found, besides its faultless principle, the marvel of the great English admiral's naval strategy. His tactics is no less remarkable. Appearing unexpectedly before the French fleet, which was at anchor, unguarded, in Aboukir bay, and, with culpable carelessness, was absorbed in taking in water,

he attacks it without hesitation, and, to better crush it, brings half the French ships between two fires by anchoring a number of his own ships inshore of the leading ones. By this bold manœuver, he gave a new demonstration of the naval theorem of superior forces.

But it is especially in the second phase of this struggle, that which ended in the disaster of Trafalgar, that Nelson's military conceptions offer us the largest field from which to gather a rich and interesting harvest; on that sad page there is much for us to learn.

In the strict blockade of Toulon and the coast of Provence, maintained through stress of weather, he already points out to us a lesson by which we can profit even now. Men and officers inured to hardships, ready for all the trials of the most difficult seafaring, must be trained at sea, in conflict with its thousand changing phases, and nowhere else. Villeneuve's men, relaxed by too long a stay in the harbor of Toulon, were no match for those of Nelson.

Note this well, for in the game of war no cards are negligible.

The French fleet, having effected a first sortie, is obliged to return to port, partially disabled and much tried by a violent storm which Nelson had sustained in the excellent state which the sea habit alone can give.

Convinced that the French squadron on leaving Toulon had stood for the eastern part of the Mediterranean, the English admiral hastens in pursuit. There were two contingencies to be faced: either the French squadron, scattered by the storm, had returned to port, or, in spite of the damages of some ships, it had continued on its course towards a destination which he guessed to be the Levant.

Thus was laid before him for action one of the many war problems that a military chief has to solve with no other aid than his own sagacity.

He seized upon the solution of pursuit as the one with the maximum of chances in its favor, being very certain that in case the fleet he was harassing had taken refuge in port he would be able quickly to find it there. And, actually, Nelson pressed on to Alexandria, and learning that the French fleet had not appeared there, without delay started back to Toulon.

It is difficult to say which is the more admirable, the promptness of decision of the illustrious seaman, or his uncommon tenacity in

carrying out his projects. He surely was a type of the great seaman, who perceived that a fleet is made to traverse the seas and not to rest in harbors.

A fortnight after his return from the Levant and his renewal of the blockade of the coast of Provence, the French fleet under Villeneuve's command again set sail and, this time favored by weather, escaped his watchfulness and stood for the Strait with a view to reach the West Indies.

Nelson, informed of this object within a few days, hesitates no more than on the previous occasion to launch himself in pursuit of a naval force which he has never failed to regard as a fit prey for him to capture and destroy. But, retarded in his voyage by incessant contrary winds and weather, he loses long days which the hostile squadron puts to good use. While he grieves over the good fortune which has deserted him, nothing disheartens him. "*The luck may turn,*" he writes; "*patience and perseverance can accomplish wonders.*" Informed, after reaching Gibralter, of the route followed by Villeneuve, he also, without any hesitation, steers for the Antilles.

It is well worth while to observe that no instructions authorized him to leave the Mediterranean, which was under his care, nor even could his doing so have been thought of. And yet, in taking upon himself the whole responsibility for abandoning the field of operations which had been assigned to him, for the purpose of furiously chasing Villeneuve, Nelson gives us a wonderful example of that rigorous solution of the problems of war which attributes to the hostile naval force the chief rôle. Why did England maintain a squadron in the Mediterranean? Surely to destroy the power of the French fleet and to assure to herself the command of that sea. This fleet, though it had escaped from that sea, was still the only proper object of pursuit, and by destroying it, *even at the Antipodes*, the freedom of the Mediterranean and the supremacy of the English naval power were assured by the same blow. Guided by this powerful and faultless logic, Nelson made sail for the Antilles in obstinate pursuit of that fleet which he zealously called HIS fleet. This has generally been considered an arrogant expression, but for my part I am tempted to regard it as the very elegant formula in which he condensed his whole theory of war.

And this was so much his idea that, having learned, on his

arrival in the Antilles, the departure for Europe of that ever vanishing fleet, he also turned back to Cadiz and the Mediterranean, energetically resolved to prevent it from regaining superiority in that sea, and disquieting Sicily.

The events which then developed are known to all: his arrival at Cadiz, where no news of the French fleet had yet been received; the indecisive meeting of Villeneuve and Calder off Cape Finisterre; the French admiral's abandonment of Napoleon's magnificent plan of war, his retreat to Cadiz, and finally the disaster of Trafalgar.

To make us understand what Nelson's *tactical method* was under these circumstances, nothing could serve so well as knowledge of the great English admiral's real thoughts. By comparing results with his anticipations, we may judge the value of his proceedings. Nelson's military idea on this special point is set forth in full in two memoranda of great enough importance to merit reproduction.

In the first, a real plan of battle intended for the captains under his command, before the memorable chase after Villeneuve's fleet, Nelson thus expresses himself:

"The business of an English Commander-in-chief being first to bring an enemy's fleet to battle on the most advantageous terms to himself (I mean that of laying his ships close on board the enemy as expeditiously as possible), and secondly to continue them there, without separating, until the business is decided; I am sensible beyond this object it is not necessary that I should say a word, being fully assured that the admirals and captains of the fleet I have the honour to command will, knowing my precise object, that of a close and decisive battle, supply any deficiency in my not making signals; which may, if not extended beyond these objects, either be misunderstood, or, if waited for, very probably, from various causes, be impossible for the commander-in-chief to make. Therefore it will only be requisite for me to state, in as few words as possible, the various modes in which it may be necessary for me to obtain my object, on which depends not only the honour and glory of our country, but possibly its safety, and with it that of all Europe, from French tyranny and oppression.

"If the two fleets are both willing to fight, but little manœuvering is necessary; the less the better—a day is soon lost in that business. Therefore I will only suppose that the enemy's fleet

being to leeward, standing close upon a wind on the starboard tack, and that I am nearly ahead of them, standing on the larboard tack; of course I should weather them. The weather must be supposed to be moderate, for if it be a gale of wind, the manœuvering of both fleets is but of little avail, and probably no decisive action would take place with the whole fleet. Two modes present themselves. One to stand on just out of gunshot, until the van ship of my line would be about the centre ship of the enemy, then make the signal to wear together, then bear up, engage with all our force the six or five van-ships of the enemy, passing, certainly, if opportunity offered, through their line. This would prevent their bearing up, and the action, from the known bravery and conduct of the admirals and captains, would certainly be decisive; the (two or three) rear-ships of the enemy would act as they please, and our ships would give a good account of them should they persist in mixing with our ships. The other mode would be to stand under an easy but commanding sail, directly for their headmost ship, so as to prevent the enemy from knowing whether I should pass to leeward or windward of him. In that situation I would make the signal to engage the enemy to leeward, and to cut through their fleet about the sixth ship from the van, passing very close; they being on a wind and you going large, could cut their line when you please. The van-ships of the enemy would, by the time our rear came abreast of the van-ship, be severely cut up, and our van could not expect to escape damage. I would then have our rear-ship, and every ship in succession, wear, continue the action with either the van-ship or second ship, as it might appear most eligible from her crippled state; and this mode pursued, I see nothing to prevent the capture of the five or six ships of the enemy's van. The two or three ships of the enemy's rear must either bear up or wear, and in either case, although they would be in a better plight probably than our two van-ships (now the rear) yet they would be separated, and at a distance to leeward, so as to give our ships time to refit; and by that time, I believe, the battle would, from the judgment of the admiral and captains, be over with the rest of them. Signals from these moments are useless, when every man is disposed to do his duty. The great object is for us to support each other, and to keep close to the enemy, and to leeward of him.

"If the enemy are running away, then the only signals necessary

will be, to engage the enemy as arriving up with them; and the other ships to pass on for the second, third, etc., giving, if possible, a close fire into the enemy in passing, taking care to give our ships engaged notice of your intention."

This first plan is a veritable discourse on tactics, for it would be difficult to express more fundamental ideas in fewer phrases. Everything is to be found there; in the way of theory, conviction of the necessity of forcing the enemy to fight, full and entire confidence in his subordinates, admirals and captains, based upon their complete understanding of the chief's plans, worthlessness of signals during battle, exposition of the principle of simplicity of methods in war. In what concerns execution, endeavor to crush a part of the enemy's line by the whole of one's own forces, and breaking up that line by passing through it: finally putting the finishing touch to victory by chasing the routed ships.

This enumeration would be incomplete, were it not added that Nelson declared, once more, that war cannot be made without running risks, nor battle engaged without expectation of injuries, and that he reminded all of the profit to be derived from a strict mutual dependence, all having a common aim. Having taken care to develop these sentiments in his subordinates, he could afford to announce that signals were useless. Not one of his principles has become obsolete; they are as eternal as the changeless truth.

The second plan of combat is better known than the first and has become famous under the name of Nelson's *Memorandum;* it is the one which was devised before Trafalgar; much may be learned from it:

"Thinking it almost impossible to bring a fleet of forty sail of the line into a line of battle in variable winds, thick weather, and other circumstances which must occur, without such a loss of time that the opportunity would probably be lost of bringing the enemy to battle in such a manner as to make the business decisive, I have therefore made up my mind to keep the fleet in that position of sailing (with the exception of the first and second in command) that the order of sailing is to be the order of battle, placing the fleet in two lines of sixteen ships each, with an advance squadron of eight of the fastest sailing two-decked ships, which will always make, if wanted, a line of twenty-four sail, on whichever line the commander-in-chief may direct.

"The second in command will, after my intentions are made known to him, have the entire direction of his line to make the attack upon the enemy, and to follow up the blow until they are captured or destroyed.

"If the enemy's fleet should be seen to windward in line of battle, and that the two lines and the advance squadron can fetch them, they will probably be so extended that their van could not succour their rear. I should therefore probably make the second in command's signal to lead through about their twelfth ship from their rear (or wherever he could fetch, if not able to get so far advanced); my line would lead through about their center, and the advance squadron to cut two or three or four ships ahead of their center, so as to ensure getting at their commander-in-chief, on whom every effort must be made to capture.

"The whole impression of the British fleet must be to overpower from two or three ships ahead of their commander-in-chief, supposed to be in the center, to the rear of their fleet. I will suppose twenty sail of the enemy's line to be untouched; it must be some time before they could perform a manœuver to bring their force compact to attack any part of the British fleet engaged, or to succour their own ships, which indeed would be impossible without mixing with the ships engaged. The enemy's fleet is supposed to consist of forty-six sail of the line, British fleet of forty. If either is less, only a proportionate number of enemy's ships are to be cut off; British to be one-fourth superior to the enemy cut off.

"Something must be left to chance; nothing is sure in a sea fight beyond all others. Shot will carry away the masts and yards of friends as well as foes, but I look with confidence to a victory before the van of the enemy could succour their rear, and then that the British fleet would most of them be ready to receive their twenty sail of the line or to pursue them should they endeavor to make off.

"If the van of the enemy tacks, the captured ships must run to leeward of the British fleet; if the enemy wears, the British must place themselves between the enemy and the captured and disabled British ships; and should the enemy close, I have no fears as to the result.

"The second in command will in all possible things direct the movements of his line by keeping them as compact as the nature of the circumstances will admit. Captains are to look to their

particular line as their rallying point. But, in case signals can neither be seen or perfectly understood, no captain can do very wrong if he places his ship alongside that of an enemy.

"Of the intended attack from to windward, the enemy in line of battle ready to receive an attack:

"The divisions of the British fleet will be brought nearly within gunshot of the enemy's center. The signal will most probably then be made for the lee line to bear up together, to set all their sails, even steering sails, in order to get as quickly as possible to the enemy's line, and to cut through, beginning from the twelfth ship from the enemy's rear. Some ships may not get through their exact place, but they will always be at hand to assist their friends, and if any are thrown round the rear of the enemy, they will effectually complete the business of twelve sail of the enemy.

"Should the enemy wear together, or bear up and sail large, still the twelve ships composing, in the first position, the enemy's rear, are to be the object of attack of the lee line, unless otherwise directed from the commander-in-chief, which is scarcely to be expected, as the entire management of the lee line, after the intentions of the commander-in-chief (are) signified, is intended to be left to the judgment of the admiral commanding that line.

"The remainder of the enemy's fleet, thirty-four sail, are to be left to the management of the commander-in-chief, who will endeavor to take care that the movements of the second in command are as little interrupted as is possible."

The worth of this document justifies its exceptional celebrity. The order of sailing will be the order of battle; it is with this admirable statement of principles that this incomparable seaman begins his instructions. It shows in the fewest possible words, that it would be the most dangerous of illusions to believe it practicable to perform on the very field of battle, face to face with the enemy, this or that complicated manœuver. From the moment that there appears any chance of an impending encounter, a naval force ought to take formation ready at any instant to open fire. In commenting on this exposition of principles, we cannot help thinking of the latest fact in universal naval history, of the battle of Tsushima, where the Russians were overwhelmed, principally because they were surprised in a cruising formation which bore no resemblance to a judicious battle formation.

In this *memorandum* two points of incontestable importance are

touched upon: the reunion of two forces of sufficient numbers to constitute a real fleet, necessitating division into several squadrons, and the composition of a reserve force on the battle field. Thus is set forth the problem of bringing into action great fleets.

The *memorandum* specifies, still more than the first plan, a tactics based upon the attack of a portion of the hostile fleet by the whole weight of the naval force. Thus it sets forth with remarkable clearness the principle of the superiority of forces, and of *relative* superiority, at one or several points of the field of battle. We already know the method, for it is that of Suffren. The manœuver by which Nelson, wishing to cut the extended line of the French-Spanish fleet, exposed the bows of his ships to the fire of that long line, has been much and often criticized since Trafalgar, on the ground that this audacious manœuver would have ended in disaster against an adversary as well trained as the English fleet, provided with as good crews, above all with as good gunners as they.

The argument has no weight: there cannot, in fact, be any rigid and absolute rule in war; everything is there, on the contrary, a question of degree. Knowledge of the moral qualities of the adversary is one of the most essential factors of war; it is necessary to the commander-in-chief all the time and under all circumstances. And it is precisely because Nelson knew thoroughly the moral and material situation of HIS fleet, the demoralization of its crews, the precarious condition of the armament of its ships, the undoubted inefficiency of its gunners, the deplorable gunnery methods used on the French ships, and finally and above all the timid and undecided spirit of Villeneuve; it is because of all that, I say, that he could and should have permitted himself the audacious manœuver under discussion.

It may well be that in the sight of I know not what academy of war, learnedly laying down the law on paper, he was wrong; on the field of action, and under the conditions, he was fully right, and the facts have overabundantly demonstrated it.

The *memorandum* further accentuates the principles of mutual confidence and self trust in battle, without which there could not be any decisive action; that which he accorded to his second in command, Collingwood, honors the latter as much as the chief himself. It was the very sign of Nelson's sagacity; a commander-in-chief cannot have confidence in his subordinates when he has

not confidence in himself. Another truth of all times and of all countries. There is the same conviction of the uselessness of signals, once the action has begun. If a captain is under fire, he is at his station! This is worth remembering and meditating upon.

Finally the most admirable thing about the famous *memorandum* is the precision of the ideas developed in it and the care which Nelson takes to make his captains understand his thoughts, the whole idea of their chief, in order that they may themselves bring to the battle one and the same conception, and supply what is needed in the solution of unforeseen cases, inseparable from every battle, in the absence of new detailed orders, of signals, and of what may be termed intuition.

That the principles of the *memorandum* were faithfully and wholly carried out is a matter of quite secondary importance; its author might die and disappear at the very beginning of the battle: he had breathed into the minds and into the very souls of his captains the principles and elements of victory; thenceforth victory was assured, and, despite his untimely exit from the battle field, it was Nelson who won the battle of Trafalgar, not Collingwood.

These conclusions acquire new force when we compare with these wise, concise and logical previsions the indecision and real demoralization of Villeneuve. Even when he set out from Cadiz, he was marked for defeat.

And now we understand and share in Admiral Bouët-Villaumez's appreciation: *"One does not know which to admire most in Nelson's memorandum: the spirit of foresight or the clearness of exposition of the plan, which covers all general cases without going beyond the limits of a quite military conciseness. Only at this cost are great successes won. How few know anything of the necessary preliminaries, and how many disasters are due to the ignorant or lazy spirit of leaders who do not think themselves called upon to play their real parts till the very day of a battle!"*

CHAPTER III.

The American Civil War. The Italian War (Lissa). Chile and Peru. Admiral Courbet's China Campaign. China and Japan.

THE AMERICAN CIVIL WAR.

In taking up the study of the American War of Secession, we begin a series having a new and considerable interest due to the fact that they will show us, for the first time, modern war material in use, steamships, armor-clads, etc., even submarines. For this reason alone, it deserves our careful attention, though we shall not be able to derive as many profitable lessons from it as from the great naval wars between France and England in the early part of the century and in the preceding century. In this conflict between parts of a single nation, those encounters of large forces, engagements of great fleets, which in the past have been not only the object but the principal method of great naval wars, are not to be expected.

Accordingly I shall give only a very brief résumé of this famous civil war. And I do this only because, despite its narrow scope, it affords material for interesting observations. One primary strategical principle dominates, in effect, the whole conduct of the war, and it may be said that the Federals' final success was entirely due to its faithful and stubborn execution. It is true that the very conditions of the opposing sides imposed this principle upon them, yet we must recognize that the one which had assumed the burden of maintaining the union knew how to profit from it. We have too often seen, we shall too often again see, the necessity of a general strategical plan in the conduct of a war, not to note in passing an evidence of good judgment on the part of a government.

The struggle was not one between two mere factions, differing apparently over the best solution of a social problem, like that of the maintenance or the suppression of slavery, but really over the question of political supremacy; it was, above all, a struggle between two peoples diametrically opposed in ideas, customs and modes of life.

While the Union States were more particularly industrial, those of the South were almost wholly agricultural. From this essential difference dissimilar interests were bound to result, and for that very reason quite different resources for making and sustaining a war.

If the Federals had many manufacturing establishments, a great industrial population, permitting them to construct rapidly war material, armaments, equipment, ships, etc., the Confederates on the other hand had little or no mineral wealth and available labor. The latter's wealth, principally based on the exportation of cotton to Europe, could only give them the means of compensating for their original inferiority by the purchase, from abroad, of war material. But this necessitated the introduction of this material *by way of the sea.*

It was precisely the intuition of this real weakness which gave rise in their adversaries to the idea of the strategic plan of which I have spoken, and the realization of which by itself alone assured the success of the Federalist cause.

To prevent the Confederates from supplying themselves with material and arms, the most certain method must be a strict blockade of the southern coast. By this means two advantages were to be gained: first, the suppression of cotton exports, and consequently the drying up of the most important source of revenue of the Southerners; second, as an immediate consequence, the impossibility of their supplying themselves with arms for continuing the war. And such actually was the result of the blockade; for if, after several years of desperate and glorious resistance, the Southerners laid down their arms, it was because, lacking everything, a prey to the most frightful destitution and completely isolated, further resistance had become impossible.

To understand how very closely the success of the Confederate cause was connected with freedom of the sea, we need only recall that at the beginning of the war the seceding states lacked cannon, small arms and munitions of war to such an extent that churches of all denominations, as well as individuals, gave their bells to be used in making them.

Under these conditions, they had to take what they could get as contraband of war from foreign countries, and as a result, at the end of the war, nearly forty different models of small arms were to be found in their equipment.

Blockade alone could stop this nourishment of the forces of resistance, and from the beginning the Federal government resolved upon the establishment of this blockade.

Beyond doubt it was not very strict at first; the navy, although almost wholly adhering to the Federal side, was not sufficiently numerous to exercise an effective guard at all points of a coast of great extent; a guard which was rendered very difficult by bad weather, fogs, etc. Thus the exploits of the blockade runners—a veritable industry and almost wholly English—which, laden with war materials, entered the Southern ports, and left them again laden with cotton, have become justly celebrated.

But little by little the Federal government, realizing the full importance of naval effort, increases its naval strength. Its fleet, which comprised less than a hundred ships at the beginning of hostilities, was of more than four hundred in the middle and nearly seven hundred ships at the end of the war. The progressive increase of the number of ships emphasizes the importance of the strategic plan as well as its continuous development. And this incessant growth equally marks the tightening of the grip which closes each day more on the revolt of the Southern states, until it ends by strangling it.

These special circumstances dictate to each of the two belligerents alike a particular system of war.

The Federal navy, having on its side the uncontested mastery, the superiority of numbers and of force, will naturally take the offensive, carrying, according to a well known phrase, its own frontiers to the enemy's coasts. The operations which it will undertake, all arising from this single general principle, will not have the sole object of neutralizing the riches of the South by a more and more strict blockade; they will also have the result of taking from the South, one by one, its forces of resistance, and finally of killing that resistance itself by penetrating to the very heart of the country, by the Mississippi.

For the Confederate States, on the other hand, who dispose only of precarious means, who have no navy, or so little of one, and are not able to improvise one (for a navy cannot be improvised), a single way is open, that of the defensive. And then, under the impulse of imperious necessity, there appear, in the theater of war, new engines, as yet scarcely roughed outlined, but for which brilliant future destinies are reserved: torpedoes and submarines.

Yet this is not all, an unarmed country, surprised by war, without having foreseen all its consequences, without having prepared its forces for that war, is driven to the necessity of seeking help from all means, from every expedient. Thus will arise the thought of attacking the maritime commerce of the Northern States, since nothing can be done against their war ships, and the cruiser Alabama will become the most justly celebrated of commerce destroyers.

But all this will serve only to prolong the resistance of the side condemned in advance to defeat because it did not have that command of the sea which was the sole source from which its life could be sustained. All the ingenuity displayed in the invention and use of mines, the marvelous bravery of the Confederate sailors in their attempts with submarines, the activity used in attacking maritime commerce, all these were of necessity unavailing.

It could not be otherwise; for, even putting aside historical examples, which have always condemned the defensive method with a persistence not to be attributed solely to chance, simple reflection indicates that a system of war based on the attack of one or several of the enemy's partial forces, without menace to the totality of those forces and notably the principal one of them, could not give decisive results.

In spite of all Robert Lee's genius, and Jefferson Davis' political skill and activity, the South of necessity was to succumb, for lack of a powerful navy.

No other war could furnish Captain Mahan a more valuable and suggestive contribution to his fine book *The Influence of Sea Power upon History.*

Such, outlined in brief, is the character of this war of secession. From our special point of view, this broad outline will be sufficient, for it includes all that can interest us so far as the general principles of war are concerned. In effect, it contains all: the irresistible action of fleets; the superior value of the offensive; the insufficiency of the pure defensive and commerce destroying, *employed by themselves alone,* to reduce the antagonistic forces and thus fulfil the object of war.

If, therefore, we study some of the details of this war, which might appear needless, it is because they furnish more than one opportunity for profitable observations.

The action of the Federals was favored not alone by the adop-

tion of a logical and fertile strategical idea; it also benefited by the energy and special ability of men like Farragut and Porter, to name only the most famous, who had to carry it into execution. Their methodical operations against the shore defences all had for objective not only the weakening of centers of resistance by the overthrow of forts or batteries, but also the acquiring of safe harbors and bases for the Federal fleet, to facilitate the maintenance of a more and more strict blockade by the shelter they would afford to the blockading vessels against the frequent storms of that coast. So too they served on many occasions to assure the landing, at fixed points, of the Federal armies intended for offensive turning movements against the Confederate troops.

From this long succession of operations, I shall recall only certain facts relating directly to the object of my book, and, at the very first an event not at all important in its immediate consequences but having a great after effect upon naval ideas and upon the path of development of naval tactics till the end of the 19th century. I refer to the battle of Hampton Roads, where on each side appeared, for the first time, in action, the armor-clad, whether improvised on the part of the Confederates by building upon the hull of a frigate burned by the Federals, the *Merrimac*, a casemate armored with railway iron, or constructed in all its parts by Ericsson, with armor of thick plating, like the Union *Monitor*, the consequence was the same. This simultaneous appearance brought to view, for the first time, two ships provided with armor impenetrable by the projectiles of the period, and that is why the fight at Hampton Roads marks an epoch in naval history. On that date not only there appeared a new fighting unity, but also there was restored to use a new weapon, or, more exactly, an ancient method of single combat, as old as the invention of galleys. I allude to the use of the ram, by which the *Merrimac* sank two Federal frigates before the arrival of the *Monitor*. The two adversaries tried to use it on the following day, but without success.

This resurrection of a method of fighting which could well be supposed forever abandoned, powerfully supported some years later by the similar occurrence of a war which we shall have occasion to study further on, has exercised a considerable influence upon naval minds, and, in our time still, few officers escape its influence. The undeniable trace of this influence may be found in

naval constructions, for the most modern and most perfected fighting ships in all navies are still equipped with rams.

Later on we shall have to discuss thoroughly the question of the efficiency of this weapon; let us now limit ourselves to the statement that the artillery of the combatants was composed of smooth bores, and that the two rams were not equipped with weapons of long range, capable of preventing a close engagement.

A second event, big with consequences, the whole importance of which nevertheless was only appreciated twenty-five years later, took place February 17, 1864, before Charleston. The Federal corvette *Housatonic* was at anchor off the city when, at night fall, an object like a plank gliding over the water was suddenly perceived. A few minutes later the object was alongside, and before the ship could escape by veering chain and backing her engines, there was an explosion, sinking the Federal vessel. The *Housatonic* had been attacked by a submarine, the *David,* commanded by Lieutenant Dixon, who in triumphing buried himself and his crew.

This pioneer is well worth naming; for if the naval art has had to wait a quarter century to realize all the profit of an invention destined to once more modify tactics, none the less this example shows the brilliant result which could already be obtained with an instrument of war incomplete, and even in the rudimentary state.

Of a submarine, the *David* really had but the name and the possibilities, for the accidents of previous trials show that the problem of stable underwater navigation had not been solved by it; the day of its attack on the *Housatonic,* it navigated on the surface. The principle alone, however, is of consequence; and to tell the whole story, the *David,* as a submarine, was much in accord with the degree of perfection of all the other engines of war of the period.

That deadly strife between hostile brothers, the war of secession, brought forth not the submarine alone; it gave birth also to an engine formidable in its effects, of uncertain action to be sure, but so much the more redoubtable as all its hits gave mortal wounds. I speak of the torpedo, of which so great a use was to be made in later wars, notably in that which we have just seen taking place in the Far East.

The successes to be ascribed to the agency of the torpedo in the war of secession are many and various. Counting ground mines

anchored in channels and floating mines, no less than eighteen vessels of war, monitors or gunboats, were destroyed by it during the war. The best known of these exploits is the destruction of the *Tecumseh*, an armored monitor sunk in a few moments in the attacks on Mobile.

To this brilliant showing must be added the victims of the torpedo borne by steam launches right up against the sides of hostile ships, a bold plan which proved that anything can be expected from resolute men who are inspired by a high ideal.

Besides the *Housatonic;* the armor-clad *New Ironsides,* the frigate *Minnesota* and finally, the most noted, the armor-clad *Albemarle* in the Roanoke river, were thus sunk.

It will be recognized that more numerous and more complete successes could hardly be expected, and the weapon by which they were accomplished certainly yields to no other in power. And it is all the more instructive to note that these results, remarkable as they were in their essential value, did not in the least alter the logical conclusion of the war. They could grievously wound the adversary, but, having no effect upon his principal force, they could have no serious effect upon his destiny.

The same thing was true of the attempts against the enemy's commerce. If I pause for a moment to consider this question, it is because the war of secession has most often been used as an example by stubborn advocates of commerce destroying, *as a sole method of war,* to defend their opinion. In the example before us, the expression "commerce destroying" is moreover unsuitable. "Commercial war" would be a more exact expression, for the pursuit of merchant ships was carried on by regular or auxiliary war vessels which had nothing in common with the privateers of former times, like Surcouf, for example.

We must not forget that the Federal commercial marine of that time consisted almost entirely of sailing vessels, which very greatly simplified the task of the commerce destroyers; finally and above all that the cruisers found in all countries, on every coast, facilities of every sort for replenishing their supplies, which it would be impossible to obtain to-day. Besides which there is the quite modern question, so delicate and complex, of neutrality, which, in the famous voyagings of the *Alabama,* forty years ago, did not excite any of the suspicious susceptibilities so prompt to be aroused in our time.

Without this, how could Captain Semmes have cruised in the *Alabama* for nearly two years undisturbed in the Atlantic and the Indian Ocean before yielding to the blows of the *Kearsarge* off Cherbourg. And the prolongation of this period of immunity was due to the Federal naval vessels being fully occupied in maintaining the blockade of the southern coast.

This time again, exceptionally favorable circumstances permitted a particular system of war to develop its action; nevertheless it did not cause the march of events to deviate in the least. Like the torpedoes, and, in a general way, all engines of the defence, it served to defeat only one of the partial forces of the enemy; powerless, as I continue to repeat, against the totality of those partial forces, and especially against the principal force represented by the Federal fleet, its action was bound to be negligible.

It is for this great lesson, much more than for its comparatively unimportant facts, that this war is of value to us.

THE ITALIAN WAR (LISSA).

The conflict of 1866 between Austria and Italy has exercised no little influence upon the naval history of the latter part of the 19th century, and, even to this day, upon opinions regarding the conduct of naval war, battle tactics and the preparation of naval material. The memories of the battle of Lissa are still so alive that their effect upon very recent exercises of our squadrons can easily be seen. For this reason alone it would not do at all to pass it by without mention.

At the beginning of this war the belligerents appeared in very unlike conditions. The superiority in material, ships and guns, as well as in numbers, undoubtedly belonged to Italy, which had spared no sacrifice to prepare a strong navy; but she too, like so many others, had forgotten that strength resides not in excellence of weapons alone but also in the training and quality of the personnel called upon to use them; in short that military power is not made wholly of physical force, but equally includes a moral force; perhaps the more important of the two, since it alone can overcome the inertia of the first and inspire it.

And it is quite thus that Tegethoff, the Austrian admiral, understood the matter when he pronounced those famous words: *"If you have no cannon, still give me ships, I will do the best I can*

with them." Like all good workmen, he would not blame his tools.

Circumstances still greatly favored the Italian fleet. Its chief, Admiral Persano, had had the rare, and so much the more valuable, good fortune to receive from his government clear and precise instructions, based upon a faultless strategical plan. On June 9, that is so say more than ten days before the opening of hostilities, the admiral already knew the firm intentions of the central power, which could be resumed in the brief formula: "*Prepare to chase the enemy from the Adriatic, to blockade him, or to attack him, wherever you may find him.*"

The search for the enemy afloat and his destruction were beyond any doubt the principal ends to be attained, in order to insure conquest of the command of the sea; they must in any case have so seemed to the Italian government, which believed that it could surely count upon a superiority of forces.

We are obliged to suppose that this simple conception of war was completely strange to Persano, for a month later he was still asking explanations from his Minister. The latter gave them to him with a precision which left no room for equivocation: "*The principal objective, before anything else, must be to become master of the Adriatic by clearing that sea of the Austrian Squadron.*"

It would be difficult to explain how so clear and logical a program could have led to such a grievous strategical error as Lissa, were it not that history has taught a hundred times already how much the instinctive, unreasonable fear of action has been and still is ineradicable in the minds of some leaders. Finally, after multiple delays, caused very much more by the waverings of his mind than by his alleged desire for a better preparation of his ships, Persano, having obtained authority to do so, resolved to make a tentative attack on the island of Lissa.

At noon of July 16 the Italian squadron, composed of twelve armored ships of a total displacement of forty-six thousand tons and of twenty-three wooden ships, frigates, despatch vessels or transports, of twenty-eight thousand tons displacement altogether, set sail from Ancona for its destination, where, after delays and hesitations of all sorts, it only got into position to attack the shore batteries forty-eight hours after its setting out.

To undertake operations against fortified works on shore, while freedom of the sea was not assured, was in itself a grave error,

since the inopportune arrival of the hostile squadron in the midst of the enterprise was always to be feared, and since a dangerous position was thus voluntarily occupied; but, if undertaken, they should have been carried on with the greatest vigor, in order to reduce to a minimum the adverse chances.

And this puts us strongly in mind of a similar operation, Suffren's attack on Trincomalee, with which a comparison is timely.

No more than Persano, did our most famous seaman have command of the sea when he made his bold attempt against Trincomalee; but at least he had already made his adversary, the English Admiral Hughes, feel the whole strength of his aggressive ardor; he knew moreover that his enemy was temporarily held up at Madras, and he recognized the whole value of activity. We have already seen how he took Trincomalee before Hughes could return to his attack.

Persano, for his part, had no idea of the prime importance of time, of the influence of rapidity of execution upon the attainment of success; in a word, of speed.

Thus, when on July 20, four days after his departure from Ancona, he saw the Austrian squadron appear, not one of his attempts against the batteries of the island had been crowned with success. Furthermore, this event found his forces in the most complete disorder; for, hoping more certainly to reduce the shore defences, he had thought it necessary to divide his forces into three portions, respectively opposed to three different points of the island.

And yet, four long days having gone by, how could he have hoped that the Austrian squadron would not have learned of his venture against Lissa?

Thus it was in the enemy's presence that the Italian squadron had to concentrate again, rallying to the commander-in-chief's flag, and it is perfectly self evident that such conditions could not but be eminently unfavorable. And they were the more so because that enemy, himself having a clear conception of affairs of war as well as a profound sense of the simplicity of its methods, had adopted for cruising the *order of battle*.

Tegethoff, then on reaching the field of battle, had behind him a naval force every element of which had but one thought in mind; to fight.

Quite different was the thought of the Italian commanders, or

at least it was more complex, for to anxiety concerning the approaching engagement was added that of the necessity of reforming as quickly as possible.

In fact, the reunion could not be completed; at the moment when the battle opened, only nine Italian armor-clads, stretched out in a column over six miles long, were able to confront the whole Austrian squadron formed in close order. The precipitancy with which, owing to the surprise, the Italians had taken formation, had furthermore the result of offering to the immediate attack of the mass of Tegethoff's squadron a partially isolated head of column.

The breaking up of the Italian line could not help resulting, and that is what actually happened.

The most interesting lesson, in my opinion, to be derived from the battle of Lissa is the exact meaning which should be given to the term superiority of forces. Like Nelson at Trafalgar, Tegethoff was inferior in numbers. To the forty-six thousand tons of armored ships and the twenty-eight thousand tons of wooden ships of the Italian squadron, armed with a total of five hundred and ninety-six guns, he could only oppose twenty-seven thousand tons of armored ships and twenty thousand tons of wooden ships, mounting altogether five hundred and thirteen guns.

And yet, as much by his boldness as by his skill in profiting by the faults of his adversary, he managed to turn the scales in his own favor by obtaining superiority of forces *at one point* of the battle field.

The essence of the battle of Lissa, in my opinion, is contained in these simple considerations. It has been customary, on the contrary, to indulge in endless dissertations attributing all its success to the formation of the Austrian squadron in double echelon; there has even been imagined in this double echelon a sort of spur, ram or wedge, with which Admiral Tegethoff broke up the Italian squadron. That is but imagery; the reality was otherwise.

Under any circumstances such a conception would give to geometry, in matters of war, a part which certainly does not belong to it; but in the case of Lissa it would have been necessary, to justify its utility, for a real engagement between two squadrons manœuvering on the field in different formations to have taken place. These manœuvers alone would have permitted a judgment of the respective values of the different formations. But after the first encounter, the action degenerated at once into a veritable mêlée,

a succession of partial combats wholly beyond the control of the commander-in-chief.

It is not to *his wedge* that Tegethoff owed his victory; but to the concentration of all his ships upon the almost isolated head of the Italian column.

We may believe, on the other hand, that if opposed, for example, to a compact, supple, thoroughly manageable column, under the direction of a resolute chief, the Austrian squadron would perhaps have regretted having adopted a too rigid and too little manageable formation. Like Nelson at Trafalgar, Tegethoff at Lissa profited greatly by the timid weakness of his adversaries.

We must recognize, however, that his boldness was justified by the certain knowledge which he had of their weaknesses.

This observation strengthens the impression, which we have already received from the study of history, that it would be vain to seek for the formula of some one formation applicable to all cases and sure to give victory.

The best movements to make on the field of battle necessarily depend upon those of the enemy, upon his activity, his initiative, his *morale*. Such a manœuver, dangerous against a resolute opponent, will be perfectly proper and will make complete success easy against another who is demoralized. In tactics, as in strategy, outside of general principles, there are only concrete cases, and since I am recalling the great English seaman, it is always useful to remember that he surely never thought of describing, on the surface of the sea, more or less ingenious geometric figures, when he led his two squadrons *in wedge formation* against the center of Villeneuve's fleet. He merely applied the elementary principle of the power of mass upon a point of feeble resistance.

I have said that the battle at once took on the character of a mêlée; it is in this series of individual combats that the events occurred the persistent repetition of which has given to the battle of Lissa a traditional aspect, and which have had such great influence on naval ideas up to our own time. In the eyes of too many people still, Lissa represents only, in effect, battle by ramming and the triumph of the spur.

The wreck of the *Re d'Italia,* struck broadside on by the *Ferdinand-Max* and sinking in two minutes, was the salient feature of the battle, and there is no doubt that we must admit that this picture is very striking in order to explain the considerable influence

of an incident which has never been repeated and the impression of which still lasts after forty years, despite altogether radical changes in naval material.

I shall limit myself to the remark that when Lissa took place, rifled artillery was still in its infancy, and that on the Austrian as well as on the Italian ships smooth bores were in the majority. The adversaries, then, like those of the war of secession, had no long range weapons at their disposal, sufficiently efficient at great distances to prohibit close action.

Tegethoff's merit was precisely that he understood that the relative impotency of the artillery, *at that time,* permitted taking all the risks of closing. His signal "*to rush upon the enemy and sink him*" was then fully justified.

And he discounted, for the success of his attack, not only the insufficiency of the guns of his time, but also the incapacity of the Italian gunners, and their lack of training, so true is it that at every stage of history the all powerful influence of preparation for war makes itself felt.

From the insignificant part played by the gun in the battle of Lissa, so insignificant that, aside from the burning of the *Palestro,* caused by an Austrian shell, gun fire did only very slight damage on either side, the attempt has been made to draw far too broad conclusions and to assign to that weapon, in the future, a secondary rôle. This is to forget that an exception only confirms the rule, which from the very beginning of disputes and battles, has been characterized by a progressive evolution tending to the production of weapons of longer and longer range. Fortunately we shall find a striking demonstration of this in the study of the actual events of more recent wars.

To finish with this engagement of Lissa (I purposely use the word of restricted meaning rather than the word battle, for the character of a great battle is not to be found there), I have only to observe that if Tegethoff revealed in his energetic attack the real qualities of a great chief, he was not completely a great chief. His victory was really only a half victory; to make it decisive, it would have been necessary for him to pursue the scattered units of the Italian fleet, to track them without truce or mercy, to take advantage of their disorder and the certain demoralization of their personnel to destroy them.

In leaving the field of battle without following the logical

sequence of his first success, Tegethoff, whatever his worth, proved that he was not of the same metal as Nelson.

It is only fair to state that, in attacking, Tegethoff disregarded the formal directions of his government, whose constant care was to be sparing of its forces. But since, to his great honor, the Austrian admiral had had the courage to assume that responsibility, once the victory was in his grasp he should have gone on to the very end.

THE WAR BETWEEN CHILE AND PERU.

Although I have included in my work a study of the war between Chile and Peru, it is not because of any expectation of finding there encounters of great naval forces such as must be expected in any modern war between powerful maritime nations. But this naval campaign, although in a restricted field, affords us a chance of an excellent lesson in strategy, and also furnishes a new contribution to the demonstration of the utility of a navy.

The respective geographic situations of the two countries, separated by a zone almost uninhabited and arid, and very hilly, insured an important rôle to their naval forces, because it was necessary for troops to avoid crossing this desert by taking the sea route around it.

At the opening of hostilities, the naval forces of the belligerents were very nearly equal. Peru had two armored ships, the *Huascar* and *Independencia*, two monitors and two wooden ships; Chile could oppose to these two armored ships, the *Blanco-Encalada* and *Cochrane*, four wooden corvettes and two gunboats. As may be seen, the two naval forces were quite comparable, although of slightly different composition.

With a clearness of decision which does honor to her judgment and was to procure for her an immediate naval advantage, Chile without delay assumed the offensive by blockading the port of Iquiqui. But, in speaking of this as advantageous, I do not mean that I can give unreserved praise to the manner of its execution, for the Chilean navy could not hope to maintain an effective blockade with two small gunboats like the *Esmeralda* and *Covadonga*. But the mere fact of vigorously planning an attack showed her energetic resolution, and by intimidating the adversary, should have taken from him a portion of his resources.

The two Peruvian armor-clads, *Huascar* and *Independencia*,

attacking the two gunboats, to break up the appearance of a blockade, sank the first by ramming her; but, pursuing the second into shallow water, the *Independencia* struck a rock and sank.

We may attribute, in a philosophical sense, some small part in causing this important event to the offensive action of the little Chilean gunboats, taken to disconcert the Peruvian sailors and diminish their needful coolness.

However that may be, the loss of the *Independencia,* by destroying the balance of naval force in favor of Chile, turned the tide of events and pointed to an end of the conflict which nothing but a reconstitution of the Peruvian fleet could possibly prevent.

And this was indeed really the decisive act of the war. Chile thenceforth possesses superiority of forces on the sea, and her opponent will never take it back from her. The *Huascar,* under Admiral Grau's excellent direction, may multiply her movements, may appear and disappear here, there and everywhere, bombard the shore batteries, capture prizes, sow terror along the whole coast, and display unexampled activity in interfering with and discouraging the military operations of the Chileans, who will not dare to embark their troops so long as she so resolutely keeps the sea. All that is true, and without exception remarkable, but it is all useless. The *Huascar* is marked by destiny, her days are counted and her end is fixed. With equal preparation on both sides, and above all equal morale, she must succumb to the superiority of material force, and as battle cannot be indefinitely escaped or refused, the day will come when, forced to fight, she will finally perish.

The combat of Punta-Agamos remains justly famous, because a drama, to satisfy the public mind, must have decorations, scenery, above all be touching; the heroic resistance of the little *Huascar* to the furious attacks of the *Cochrane* and *Blanco-Encalada,* responds wonderfully to these aspirations. But for us, who have to weigh matters with more calm deliberation, the essential fact, the *determining cause,* will always be the initial weakening of the Peruvian naval forces.

The capture of the *Huascar* by Chile definitely ratified the conquest, already virtually won by that nation, of command of the sea. Thenceforth she could freely transport her troops to the Peruvian coast, blockade its ports, and as a last resort force upon Peru an agreement. The final victory was truly the navy's doing.

This war in the Pacific not only gives a lesson in strategy, but it also affords opportunity for valuable tactical observations.

The battle of Punta-Agamos is really, in the chronology of naval battles of modern times, a turning point of history; it inaugurated the reappearance, on a brilliant stage, of a too long neglected weapon, and one which will resume, after a half century's unjustifiable obscurity, a place which will not cease to grow in importance till it has become the very first: I speak of the gun. And it is truly by the gun, and by the gun alone, that the *Huascar* was defeated and at last compelled to lower her flag.

That is not all. This fight marks yet another memorable date, for it gave a wholly experimental proof of the fact that an armored ship had other weak points than those that were sheltered by an armor thought invulnerable; and that, through them, her source of life could be reached.

When the *Huascar, unable to longer resist,* surrendered, the command had descended to the seventh officer in order of rank, the six seniors having been killed in succession; a third of her crew were dead or wounded, and there remained on her not a single gun capable of being fired. But this ship, become an inert wreck by reason of the destruction of her personnel, was so little damaged in her essential parts that, hardly a few weeks after the battle, she was cruising again under the Chilean flag.

Already new times could be foreseen in which, the gun having rightly again become the incontestible arbiter of naval battles, it would be judged much more reasonable to seek to attack a vessel at all points than only in a zone of too limited extent not to make the chances of striking it very uncertain.

From all that precedes there arises, as may be seen, the clear impression that the lessons of history are not measured by the stature of its events, and that in such a small theater as that of the war between Chile and Peru, the harvest may be valuable and abundant.

ADMIRAL COURBET'S CAMPAIGN.

For the reason just given it will be interesting to examine the broad outlines of Admiral Courbet's Chinese campaign. Here again we shall find no great military doings. China, properly speaking, had no navy, or at least what constituted the germ of one could not stand against the naval forces disposed of by France.

Therefore we are not going to seek examples of encounters of squadrons or large groups in this campaign; but every military action, small or great, is the enforced consequence of a controlling thought, of a general plan aiming at a determined object; it necessarily derives from either good strategy or bad strategy; and that is exactly why the analysis of every war campaign, no matter how narrow its limits, contains a lesson.

Moreover this affair is one in which our own country was engaged, and that reason alone should suffice to attract our attention to it. The attentive examination of past errors should help us to avoid making errors in the future.

Nobody any longer seriously denies that a great many errors were committed in this Chinese campaign; and here let me make my position clear. Confining ourselves exclusively to the study of war, for that very reason we owe it to ourselves to bring to that study absolute sincerity and frankness; the errors made in the conduct of the war are all that concern us, but we must not conceal any of them.

It suffices to run through the official correspondence between the government and Admiral Courbet for these errors to become apparent, almost from the first telegram.

The most important of all of them, beyond any doubt, is the absence of a supreme controlling idea—of a coldly matured plan of operations—which is revealed by the collection of dispatches. In this respect, they evidently live, in governmental circles, from day to day, under the unstable impressions of events, without well knowing what they wish, or whither they are tending. And, as is inevitable in such cases, the commander-in-chief is closely held in leading strings, by which the wonderful privileges of action are paralyzed.

After the ambush of Bac-lieu, Admiral Courbet had received orders to set out for the north of China and to hold himself in readiness to seize *guarantees,* if that power refused to accord legitimate compensation. I have purposely used the very word which served to make known by telegraph the governmental idea; for the insistence with which it was repeated, in the subsequent official correspondence, indicates that it was the cherished hope of the French cabinet to lead China to an agreement by the seizure of territory belonging to her.

I do not condemn the principle itself of taking guarantees.

This procedure should necessarily be counted one of the many ways that can be employed to injure the forces of an enemy, and doubtless it is an attack upon them, especially upon their morale, to take possession of one or more portions of the national domain.

Yet it is indispensable to make a good choice of these guarantees, and such was not the case, certainly, when the French government designated to Admiral Courbet the island of Formosa as that whose seizure would intimidate China. That was ill to comprehend the special characteristics of the vastest empire of the world, so vast that its nationality is a pure abstraction and that North Chinamen and South Chinamen, not speaking the same language, have lived to this day in the most complete reciprocal indifference.

Formosa was already very far removed from the center of Chinese life for it to be hoped that its conquest would greatly affect a public opinion which, moreover, was completely misled by a controlling bureaucracy interested in concealing from it the truth by representing defeats to be brilliant victories.

Moreover, the island had too large a population to think of trying to conquer it by the insufficient means of landing parties from the French squadron. Finally, from the seaman's point of view exclusively, the choice of Formosa was a detestable one, since that island was destitute of safe and sheltered harbors. This is plainly seen when, after having given up the occupation of Kee-lung on account of insufficient troops, it was wished to maintain a blockade of that port. At the same time with this difficult and useless operation, the admiral was ordered to blockade Fu-chow.

The second error; scattering of efforts, so contrary to all the principles of war, which demanded, on the contrary, their concentration, with a view of obtaining the superiority of forces.

To conquer nations, as with individuals, the heart must be struck at. It was at the very center of the Chinese power, then, that blows should have been directed. Admiral Courbet would not have been the great chief who has left with us an imperishable memory, if he had not felt these essential truths. Accordingly he proposed to the government, only a few days after the opening of his campaign, to take the proposed guarantees in the Gulf of Petchili, and he indicated Port Arthur and Wei-hai-Wei as the two most favorable places. The mention of these two names is peculiarly suggestive in view of the future events which on two

different occasions took place on those shores. This common sense strategic plan the French government could not comprehend; it maintained its first project of purposeless blockade of the coast of Formosa.

On August 22, 1884, China having refused all satisfaction, an active move was decided upon, and on the following day, Admiral Courbet, momentarily free from restraint, accomplished his fine feat of arms in the river Min and destroyed the arsenal of Fu-chow.

But this tentative activity was only to be for the occasion, since the government's instructions, immediately afterwards, turned again and more obstinately than ever the valiant admiral's efforts towards the useless Formosa undertaking.

Acting under the dictation of his honor and his responsibility as military chief, the admiral could not but reopen the subject with his government, to explain the weakness of the operations, without any possible result. which were forced upon him, and at the same time to propose those which the true theories of war indicated.

On September 4 he set forth in a telegram to the Minister of Marine the difficulties of the capture and retention of Kee-lung and Formosa with the resources at his disposal, and the disproportion between the necessary effort and the profit to be drawn from a venture against an island too far away, as Fu-chow was, from Pekin, to influence the Chinese government in the desired manner. And he added: *"It would be better to begin operations at once in the north; we would take Che-Foo as our base, and establish there the troops which would enable us to occupy Wei-hai-Wei and Port Arthur."* Some days later he reverted to the subject: *"My plans are: to start for Che-foo with the forces available, to take the islands at Che-foo as a center of operations and supplies, from Che-foo to fall upon the Chinese naval forces, to attack Wei-hai-Wei and Port Arthur by sea; to occupy them with the available troops, if possible; if not possible, to establish ourselves on the best points of the Miau-Tau islands to blockade Port Arthur and the Gulf of Petchili."*

To fall upon the Chinese naval forces! We find in these words from Admiral Courbet's pen the application of a doctrine which we have already more than once met with, and which begins to appear to us as the foundation stone of the theory of war. Its

execution would have made necessary the use of all the disposable naval forces and the sending of a few troops; but with blind obstinacy, the French government, in all its instructions, went on, in somewhat puerile fashion, reiterating its fixed idea of *having in hand a guarantee with a view to reopening negotiations,* and refused to furnish the troops. So, to satisfy this fixed idea, important forces, which would have been much better employed elsewhere, had to be left stationed before Kee-lung. The reverse of Tamsui, and the obligation closely to blockade Formosa, were to demonstrate the ineffectiveness of this method to bring China to yield to the French demands. As we know, it was only by stopping the exportation of rice that this result could be attained at last; this can not surprise us, for only in that way were the vital interests of China touched.

Even the foregoing very brief analysis of this campaign furnishes matter for important reflections.

We have there seen an admirable chief, full of energy and of wise resolution, having a very clear sense of the fundamental rules of the conduct of war and capable, surely, as he has proved himself, of accomplishing great deeds, if the blundering control of an authority exercised from thousands of miles away had not neutralized these incomparable qualities. Quite like Tourville before him, Courbet suffered from too heavy fetters placed by the government on his military actions.

In striking contrast to this is what will happen ten years later in the same theater. We shall not find then, at the head of the Japanese fleets, admirals of such exceptional worth as to deserve immortality, but on the other hand we shall see a staff already conscious of the impossibility of military improvisations, knowing what it wishes and with a firm will to attain to it, having prepared a plan of operations in conformity with sane principles and carrying it out to the end without weakness. We had "*the man,*" but we neglected preparations for war, as well as war itself; in the contest between China and Japan, the conquerors did not have "*the man,*" but they knew how to prepare methodically for war and to carry on war. This was an experimental proof that the system to which von Moltke owed his successes in 1870 is as excellent on the sea as on shore.

One other observation is necessary; there are no profitable operations possible in a war the details of which the political

power pretends to direct, when the distance of the field of action forbids its determining their relative importance and following their progress.

We have already had occasion to exhibit the productive freedom of action which Nelson of good rights enjoyed, the elasticity of the general orders given to him, wholly contained in the brief and clear formula: *to win command of the Mediterranean,* which permitted him to follow the enemy's fleet even to the Antilles.

Suffren, he also felt the full value of military independence when he wrote the Minister, de Castries: *"The king can be well served in these far off countries only when those in command have great powers and the courage to use them."*

Moreover, our illustrious seaman had found a man capable of understanding him in this Minister who wrote to him: *"The king has announced to you in your instructions, Sir, that all courageous acts which his generals may do, even though they fail of the success which their boldness deserves, will be none the less honored of him, and that inaction is the only thing with which he will be displeased."*

I have already affirmed under too many circumstances the necessity of building everything upon a system of definite responsibilities for anyone to suppose that I am defending the delegation of powers. It belongs to the national authorities alone to give the initial impulse, to establish what may be called the program of future hostilities, but if one makes war, of his own accord or because he is forced to, it matters not which, he must know how to make it; once the war has begun, its direction belongs to the military chief. Every other method leads straight to defeat, and if all the conquests of modern progress in the matter of rapidity of communications are to have for a consequence restraint of the indispensable initiative of the supreme commander in the field, all the benefits which they confer will not be sufficient to make up for their evil effects.

That is why I could not let slip the chance of expressing myself frankly on this subject. If there be need of supporting the examples of Suffren and Nelson, we have the great authority of Napoleon, the master of the subject. Treating, in his Mémoirs, of the duties of generals, he expresses himself as follows:

"A general in chief is not relieved of responsibility by an order from a minister or a prince far from the field of operations and

knowing badly or not knowing at all the last state of affairs: (1) Every general-in-chief who undertakes to execute a plan which he thinks bad or injurious is criminal; he ought to make representations, to insist upon a change, finally to resign rather than be the instrument of the ruin of his own people; (2) Every general-in-chief who, in consequence of orders from a superior, delivers battle with a certainty of losing it, is equally criminal; (3) A general-in-chief is the first officer of the military hierarchy. The minister, the prince give directions to which he must conform in his soul and conscience; but these directions are never military orders and do not exact a blind obedience; (4) Even a military order is to be blindly obeyed only when it is given by a superior who, being on the spot at the moment of giving it, knows the state of affairs . . . ."

It seems to me well to give these quotations, not only because, with due regard for the proportions of course, they apply to the campaign we have just been considering, but also because they condemn the unfortunate natural tendency of the central authority, in almost all contemporary wars, in all countries, to meddle with the practical conduct of operations. I am inclined to think, for my part, that the repeated defeats of General Kuropatkin, on the plains of Manchuria, had no other original cause.

THE WAR BETWEEN CHINA AND JAPAN.

The war between China and Japan was carried on by the Japanese government, as I have already said, in an infinitely wiser way. A savage attack at the beginning, before any official rupture, was the first manifestation of the manner in which it intended to operate. By sinking, without formal declaration of war, a transport laden with Chinese troops, and by attacking some Chinese cruisers, the Japanese indicated their intention of not letting things drag out to great length. They, also, drew inspiration from the formula "quickly and thoroughly," and if, from the sentimental point of view, which we need not here regard, this action was of doubtful propriety, it offers in the special order of ideas of our studies a valuable hint.

And truly the execution of their plan, from beginning to end, was carried forward with the same resolution. The Japanese government well understood the whole value that can be derived from a seizure of guarantees; but it never thought of chosing them in

some useless island, almost unknown to the Chinese world, in any case too far from that empire's brain for events taking place there to make an impression upon it. It is in the Gulf of Petchili, in that way of entry to the capitol, that the Japanese are going to strike.

Their initiation into the military doctrines of high war was certainly of very recent date, since, less than a quarter of a century before, their sole war material was the Samurai's sword, and their navy had no existence, and yet they had been able so completely to assimilate them as to afford an example to more than one nation rich in old traditions.

"Aux *nations* bien nées,
La valeur n' attend pas le nombre des années."

I am tempted to point out an initial error which they made, although it had no evil consequences: their first effective military operation was the transportation of an expeditionary force to Chemulpo. Looking at it from a purely traditional point of view, it is certain that, *in the very interest of the success of this undertaking*, their first care should have been to "fall upon the Chinese fleet" to destroy it, or in any event to put it out of any condition to do harm, by blockading it in its port of refuge, and to assure to the Japanese navy the command of the sea.

Doubtless the very judicious arrangements made by Admiral Ito for the passage of the convoy, the protection of the transports en route by the squadron, the precautions taken to clear the way and to avoid any possible surprise on the part of the Chinese squadron, reduced to a minimum the hazard of this infraction of fundamental principles. With different adversaries than the Chinese, it might nevertheless have cost dearly, for a sudden attack, by a very small, manageable naval force, on a fleet embarrassed by the care of a convoy, will always put the latter in a very disadvantageous position.

The fact is that we must suppose the Japanese admiral to have had the conviction, which he certainly ought to have had, that with such adversaries as the Chinese he could permit anything; he was quite right in that. And this observation has its value, for as we have already many times pointed out, there exists in every war a psychological side which must not be neglected.

The commander-in-chief of the Japanese fleet, moreover, a few days after the combined operations at Chemulpo, was to return

to basic principles by seeking the Chinese squadron and inflicting upon it a defeat, near the mouth of the Yalu. It is particularly suggestive to note that Admiral Ito benefitted, to a very considerable extent, by a strategical error, due to Admiral Ting, and of the same nature as that which he himself committed in the operations at Chemulpo.

The Chinese admiral had himself decided, on September 16, to proceed to land troops, without having in the first place sought to destroy the adverse forces. There, where his rival had succeeded fully, he was to meet with a complete reverse, so true it is that only those conclusions which take account of many contingencies can be registered as truths in war.

Just as the Japanese navy was trained, disciplined, homogeneous, conscious of its own strength, so, to the same extent, the personnel of the Chinese fleet was made up of disparate elements, without either training or military education, with no binding ties, not even that which faith in a common ideal gives.

Therefore, even with equal material forces, Ito had the superiority of forces.

The Chinese admiral was at anchor on September 17, with his squadron, at the mouth of the Yalu, when the Japanese fleet was signaled; he at once got under way to approach the latter.

The two squadrons in sight were quite comparable, as well in number of ships as in their total tonnage, and also in their armament. The superior protection of the Chinese ships—even very decidedly superior, for the two battleships *Ting-Yuen* and *Chen-Yuen* had belts of 355 mm. and the two cruisers *Lai-Yuen* and *King-Yuen* belts of 240 mm., while among the Japanese ships the only battleships, the already old *Fuso* and *Hiyei*, had a central redoubt—was compensated by a real inferiority in speed.

These two naval forces advance against each other in very different formations. The Chinese admiral in a very open wedge formation the point of which was occupied by his strongest ships, while Admiral Ito had arranged his ships in column. Moreover this was not merely the ordinary long column of ships, but comprised in reality of two independent *homogeneous* divisions, or at least as *homogeneous* as they could be at that epoch, composed of similar ships ranged, in each of those divisions, in column.

This arrangement gave to the Japanese squadron all the advantages of flexibility of the traditional column with an increase of

mobility; this same scheme of formation was to be employed ten years later, with equal success, by Admiral Togo.

At this point of our exposition, having explained the respective positions of the two forces, we are strongly reminded of something. These positions recall to us the identical ones at the battle of Lissa, double echelon with center leading on one side and column on the other; but here the rôles are reversed. The column is in close order, flexible and manageable, as much as that of the Italians was open and sluggish; the compact formation is as little rigid as that of Tegethoff was resistant.

If ordinary common sense failed to do so, this actual comparison would suffice to demonstrate how little geometry counts for in the matter of battle formations.

The regular presentation of their bows to the enemy put the Chinese ships under extremely disadvantageous conditions for battle.

While the Japanese, presenting themselves broadside on by the development of their columns, had all their guns bearing, the Chinese could only use their bow guns and were thus condemned to a notable inferiority of gun fire. This inferiority was to become still greater after the first phase of the battle by reason of the very judicious dispositions taken by Admiral Ito. The latter, anxious to make up for the disadvantage of the insufficient protection of his ships, and at the same time wishing to profit by his undoubted superiority in speed and gunnery, while he kept his two columns at a distance from the enemy always greater than three thousand meters, followed a very gradually changing course, with the first division composed of the fast protected cruisers leading, so as little by little to outflank the right of the Chinese squadron. That wing, which was constituted of small cruisers of little military value, was almost immediately crushed, and the main force of Chinese battleships, turning two points to starboard to come to their assistance, destroyed all regularity in their formation; the fire of some ships became masked by others, and the battle was lost to the Chinese.

This battle of the Yalu, the description of which I shall purposely limit to this brief sketch, has given rise to much writing. Analyzed with passions and preconceived ideas inspired by reasons most often foreign to the single consideration of the technical question, it has sustained the most widely different opinions.

Later on the same thing will occur in relation to the Russo-Japanese war.

To show how necessary it is to be careful in formulating conclusions from the actual events of war, I will call attention to the fact that, from the mere consideration of this single incontestable result of the defeat of an armored squadron by another composed of only protected cruisers, the conclusion has been drawn that the day of armored ships is over.

As for us, wholly absorbed in the professional problem, and moreover knowing the importance of the associated facts, we shall avoid so superficial and hasty a judgment; but, insisting upon our right to free discussion, at least to that which is wholly based on experience, without seeking to distort it, we shall draw from this battle a lesson which, though less definite, will not be less useful.

The crushing of the two wings successively by the turning movement of the Japanese had resulted in reducing the resisting force of the Chinese squadron to the battleships alone. Overwhelmed by the fire of the whole Japanese squadron concentrated upon them, swept by an iron storm which struck down their masts and superstructures, smashed their guns and destroyed all their means of internal communication, these unhappy ships, after an action which had lasted four hours, were reduced to a state of impotency. They were ready to receive the death stroke, without even being able to strike a last blow as they plunged to destruction, when Admiral Ito, out of ammunition, withdrew from the battle field; lacking torpedoes, we must add, which at that moment without any risk would have been able to *finish* the Chinese battleships.

Thus, in spite of its brilliant success, the victory of the Japanese fleet was incomplete, and furthermore, though disabled to the extent of being military wrecks, the Chinese battleships still kept afloat. They floated so well, were so little injured as regards their buoyancy and in their essential parts, that a few months later they were able to serve under the flag of the conqueror.

After Punta-Agamos, Yalu reminds us that to reduce a warship we are not necessarily limited to the single and somewhat chimerical design of attacking her water-line, and finally that the limit of the capacity to resist of the personnel can be reached without destroying the buoyancy. Just like the *Huascar*, the *Chen-Yuen* and *Ting-Yuen*, without guns and fighting against fires, yielded to the effects of gunfire against their upper works.

Such in my opinion is the great lesson of the battle of the Yalu. This battle, which destroyed the balance of power in the Gulf of Petchili to Japan's advantage, gave the latter, from that time on, command of the sea. Thenceforth, the capture of Port Arthur by the Japanese army was merely a question of time, and with that place there would fall into the hands of the Empire of the Rising Sun one of the double gates of entry into the Celestial kingdom. The other gate, Wei-hai-Wei, remained to be taken; its conquest was the object of a combined operation of the fleet and army.

From a strictly naval point of view, the attack on Wei-hai-Wei has no other real interest for us than through the important co-operation of the Japanese torpedo-boats in the military enterprise. To tell the truth, the affair of Wei-hai-Wei was not the first entry upon the scene of these little vessels; already, in the Russo-Turkish war, they had made their proofs and shown what could be expected from these new instruments of battle when they were commanded by energetic and resolute men.

The offensive use of torpedo-boats, acting with the squadron assisting in the attack on Wei-hai-Wei, was perfectly logical. In the impossibility of the large ships approaching closely to the inner harbor without imprudently exposing themselves to the fire of the powerful batteries along the sea front, a night attack of the torpedo-boats was the only possible way to destroy what was left of the Chinese fleet.

At all events, it may be seen what a variety of ways there are of using these little vessels, and that it would be a pity to confine them exclusively to a passive rôle by assigning them permanent stations at the different parts of a coast to be defended. But it would be equally a mistake to assume that torpedo-boats are not weapons for coast defense. Their sea-going qualities, necessarily limited, require the proximity of safe shelters where they can take refuge in bad weather.

We shall see later on that at Tsushima the state of the sea did not allow using them during battle; so that they can not always be counted on as certain aids in purely offensive operations. They really constitute, applying Jomini's happy expression to the navy, the "defensive-offensive," and they offer proof of the correctness of the principle that the surest way to defend is to attack.

Wei-hai-Wei taken, the way to Pekin was open, and the Chinese

government had nothing else to do but capitulate. Thus were justified the views of Admiral Courbet, and once more verified certain general rules of strategy that cannot with impunity be violated in the conduct of war.

If now, taking a general view of the Chinese-Japanese war, we seek to determine its character, it appears to us that, like many others, it has consecrated the influence of preparation for war, and proved its superiority over carelessness and indifference in military affairs, it has shown the importance of the morale and training of the personnel, and finally it is a guarantee that success will result from having a directing principle, a plan of operations, as opposed to absence of initial conceptions and reliance upon luck.

A firm will in the pursuit of a well-defined end will always triumph over indecision and lack of foresight.

CHAPTER IV.

The War Between Spain and the United States.

The Spanish-American war, like the one preceding it, embraces no great military facts capable of throwing by their lessons a brilliant light upon the vital problems of the constitution of fleets. Although certain consequences of the battle of Santiago, which really do not exist, have been imagined by minds imbued, perhaps, with preconceived ideas, it is really on account of its many moral lessons that this war is worthy of remembrance.

In that respect, the harvest will be rich. For no other war, perhaps, has shown to an equal degree the influence which neglect of preparation for war exercises upon the results of an armed conflict. From this point of view, we could not devote too much time to studying all its details.

It really seems as if in unhappy Spain the phenomenal carelessness concerning military organization is a sort of endemic and incurable evil, for warnings have not been wanting to her in the past. We have retained the vivid memory of the lamentable condition of the Spanish fleet at the time of the events of 1805, the incessant complaints of Villeneuve, as well as the contemptuous sarcasms of Nelson in regard to that naval force. It would appear incredible, then, that lessons so dearly paid for should not have profited that country, which, one hundred years later, was to go to battle under conditions quite the same as before. This example has an immense philosophical meaning, for us in particular; for, companions of the Spaniards in misfortune a century ago, we, at least, ought to draw moral profit from the persistent causes of their ills.

THE STRATEGIC ERROR OF SPAIN.

At the very beginning of this war, we find a strategic error on the part of the government, as we shall find a similar one at the beginning of the war between Russia and Japan; and it was this original error which, in both cases, bore with its whole adverse weight upon the conduct and the results of the war.

The Spanish government could not be unaware of the views of

the United States regarding the Pearl of the Antilles. The sympathies, avowed under all circumstances, of the American people with the cause of the insurgents, the secret or open aid which was extended to them upon the Union territory; everything, up to veiled or openly expressed propositions to purchase Cuba, made several times by the American government, was of a nature to open the eyes of the most incredulous as to the actual desires of America and the dangers to Spain which would result from them.

And the latter country, when war broke out in 1898, in complete naval anarchy, had not even the excuse of having been surprised by events, for these manifestations of the state of mind of the Americans were not of recent date. As long ago as 1823, Adams, Secretary of State, wrote: *"There are laws of political as well as of physical gravitation; and if an apple detached by the wind from the tree which produced it can only fall to the earth in virtue of the law of gravity, so Cuba, separated by force from her own connection with Spain, and incapable of standing alone, can only gravitate towards the North American Union, which, following the same law of nature, cannot reject her from its breast."*

As may be seen, the desires were scarcely dissimulated; hence, if Spanish pride could not resolve itself to yield the island of Cuba at a good price, it was necessary to prepare a military force capable of defending it against any attempt at aggression and of holding on to it.

To defend Cuba there was a choice between two methods: either to make the coasts of that island bristle with forts and batteries, to sow the approaches of her bays and harbors thick with torpedoes and to maintain permanently a formidable army; or, on the other hand, remembering that another great island, Great Britain, had been able to preserve throughout the wars of the past the inviolability of her territory without forts or batteries, without torpedoes and without an army, in fact, without any passive defence whatever, but wholly by the invincible might of a powerful fleet, also to prepare a navy strong enough to command respect.

If we only reflect that every aggressive move against Cuba, necessarily having to be by way of the sea, required, prior to any military operation, the conquest of maritime supremacy, without which transportation of an expeditionary force is impossible, we will quickly agree that the strategic solution of the retention of

Cuba by Spain likewise depended upon that power's holding the command of the sea, and consequently, upon the building of a powerful navy.

In thus setting forth the necessary principle of what has been named the "command of the sea," we anticipate the conclusions which we shall draw from the study of history; but we can nevertheless, from now on, use the example, conclusive above all others, of Napoleon's designs against England, the sole cause of whose failure was his inability to assure the freedom of the sea.

Certain facts of the very war that we are now considering will be used later on to strengthen this argument.

The financial burden necessary to create a fleet was not so excessive that the Spanish nation, weighted down with debts as it was, would have been unable to support it. At the moment of the opening of hostilities, the American effective naval strength, in ships having a real military value, was actually five battleships of eleven to twelve thousand tons, *Iowa, Indiana, Massachusetts, Texas* and *Oregon;* two armored cruisers, *New York* and *Brooklyn,* of eight thousand tons; and eleven protected cruisers of a displacement varying from three to six thousand tons, *Cincinnati, Philadelphia, Charleston, Newark, Columbia, Minneapolis, San Francisco, Olympia, Baltimore, Raleigh* and *Boston.*

I do not mention steamships requisitioned by the Americans to serve as auxiliary cruisers, that reserve force of secondary importance being largely available at all times to both belligerents, and not requiring the patient and methodical preparation of fighting units of the first class.

To impose respect upon this surely modest fleet, it would have been sufficient to oppose to it, *concentrated in Cuban waters,* as homogeneous a squadron as practicable of twelve armored cruisers of twelve thousand tons, whose construction should have been the constant care of the Spanish government for more than fifteen years past. The cost of such represents a sum of three hundred million francs, to which must be added ninety millions for the protected cruisers necessary as its auxiliaries. That, however, is not all, for a fleet cannot shift for itself, especially in our times, and there are needful to it one or several bases of operations provided with abundant stores and the various requirements necessitated by the state of naval war. To be efficient, a base should be as near as possible to the theater of war; in the case we are con-

sidering the best situation by all means was on the coast of the island, at the very center of naval operations. Spain had only the difficulty of a choice between the numerous bays of the island. It is not exaggerated to compute at three hundred millions the expenditures for organizing a reliable and suitably equipped base for a squadron such as we have just described.

There would have been required, then, a total expenditure of six hundred and ninety million francs; spread over the preceding last fifteen years it represents an annual contribution of forty-six millions. Adding two millions, absolutely necessary for the military training of the personnel, for gunnery and squadron exercises, we arrive at a total of forty-eight millions, or let us say fifty millions in round numbers, as the annual financial burden that the certainty of safeguarding her colonial interests imposed upon Spain, outside of her normal budget of expenses for maintenance.

Such a sacrifice, relatively slight, was surely possible; it would have been a tremendous economy, in view of the very great loss sustained by Spain on account of a war waged under miserable conditions as well as through the complete suppression of the revenues which she drew from her American colony and which very often had served to balance the budgets of the mother country.

Doubtless objection will be made, based upon the tremendous additions made to its navy by the United States government, after the war of 1898, that if this contest could very certainly have been avoided by the means I have just pointed out, the fatal moment of conflict between the desires of North America and the resistance of Spain would merely have been delayed. I willingly recognize it, and I am willing to admit equally that Spain, poor and in want, would not have been able long to resist the all powerful influence of the American dollar, sovereign master in the maintenance of that costly luxury, a strong navy.

But anything was better, under any circumstances, than that struggle without honor or dignity undergone by the Spanish government, and if naval strength was really beyond its means, it had only to take to itself the very just remark of Napoleon, apropos of the cession of Louisiana: "*No colonies are possible without a navy,*" and in its turn consent to give up Cuba.

It is because these preliminary critical remarks have reference to a situation not at all peculiar to Spain that I have so readily

yielded extensive consideration to them. We shall have occasion to revert to it with greater detail when we study the contingencies of possible conflicts, and to show how this example concerns to the highest degree our own country.

It is on that account particularly that I have thought it necessary to emphasize an initial political error which hampered the whole conduct of the war by its evil influence, and by itself alone brought about Spain's defeat. And if we were limited to the mere study of high strategy, we could at this point stop in our examination of the Spanish-American conflict. The causes of Spanish disasters are already sufficiently indicated, so true it is that the politics of a nation are the true inspiration of the strategy of its armies, the directing idea of its military action.

"*Give me good statesmanship, and I will give you sound finance,*" said Baron Louis. It would be equally true to say: "*Give me good statesmanship, and I will give you adequate military forces.*" The bond between the one and the other is indissoluble; the example of Spain is the proof to be pondered by many other nations.

THE FORCES OF SPAIN.

The Spanish navy entered upon the struggle in a condition of the most lamentable inferiority, and not alone through its insufficient material, but especially through the lack of preparation of its personnel.

It comprised four battleships of from seven to nine thousand tons, four armored cruisers of seven thousand tons, and four protected cruisers of from two to four thousand tons. Of the four battleships, two old and obsolete units, *Numancia* and *Vittoria,* are only named as a matter of form. In reality, the only real strength of the Spanish fleet was in the two battleships *Pelayo* and *Carlos V,* and especially in the very homogeneous division of the four armored cruisers *Infanta Maria Teresa, Viscaya, Almirante Oquendo* and *Cristobal Colon;* though this last was without her two heavy turret guns of 25 cm.

Although this was the case, the Spanish government, in one of the many manifestations of its stupefying incompetence in the affairs of war, heedless that the first step towards success is to seek the superiority of forces which concentration at one point alone can give, did exactly the wrong thing by dividing its own.

Under the impulsion of an energetic and bold leader, much might have been hoped from the action of a squadron formed of these six ships; at all events, it would not have been negligible, being concentrated, and, lacking other advantages, would have been able to save by its resistance the military honor of Spain. This arrangement was really planned for a moment at the beginning of the war, but it remained a project only.

This fundamental principle being violated, the two battleships placed under Admiral Camara, as we know, played no useful part in the war, and even had to suffer the ridicule of a futile sortie towards the Philippines.

As for the division of armored cruisers, the only force to which Spain was willing to prescribe a semblance of action, it was far from having the ardent and warlike chief, the leader of men whose appearance upon the scene we have above evoked.

Who is now ignorant of the lamentations of the unfortunate Cervera? Complaints, before the war, during it and after it, of the miserable condition of the material, the incapacity of the personnel, the poverty of the most essential articles, etc., protests against the orders he receives; all these weaknesses have been fully displayed and have exposed to their smallest details the faults which have made Spain incapable of victory.

That unhappy admiral knew not Bülow's fine saying: *"One is never whipped so long as he refuses to believe that he is."*

Furthermore, this condition of moral depression in a leader invested with the redoubtable honor of a great military responsibility is no novelty to us; in Cervera we find the same state of mind which, in Villeneuve, spent itself in endless lamentations over the bad condition of his ships, the difficulties which interfered with the execution of the orders given him, etc. And what makes the resemblance still more striking is that, a century apart, the two leaders, alike brave individually, but equally incapable of effective action, found their force of protest in the single thought of a personal defence before the perhaps too severe judgment of posterity.

Upon reflection, this need not astonish us: Villeneuve and Cervera were merely the natural products of two equally feeble organizations, the French navy at the end of the eighteenth and the beginning of the nineteenth centuries and the Spanish navy at the end of the latter century. Generals-in-chief are only able to reflect

the environments in which they were developed. To have men equal to becoming *great leaders,* there must be necessarily, except under extraordinary circumstances, schools of energy, and they were not to be found in either of the two navies referred to. The preceding philosophical observation has a very wide application, for it is a precept to be remembered always and everywhere.

As extenuating circumstances, we must by no means forget the extremely insufficient resources placed at the disposition of these two seamen, and though their poverty of action must be charged against them, the greatest part of the responsibility for the disastrous results rests beyond any doubt upon their respective governments.

At the moment when Cervera received orders to set sail, he lacked the most indispensable appliances: his ships had been unable to fill up with coal at Carthagena, his supplies of ammunition were incomplete; there was nothing, even to charts of the West Indian seas, that was not wanting on his ships.

The letters of Admiral Cervera, from which I shall frequently quote, are taken from the interesting translation published in the *Revue Maritime* by Commander Mourre.

Under date of March 3, 1898, the admiral wrote to his Minister: *"My reflections which so painfully affect you are doubtless very grievous, and yet perhaps I am short of the whole truth! A proof of this is the lack of money which makes the acquisition of cartridges for the Colon difficult, and this on the eve of war against the richest nation in the world. Even here, when it is a question of reloading the empty fourteen-centimeter cases, I have been told that it is impossible . . . . No matter what the occasion, our lack of resources, the absence of organization,* IN A WORD THE WANT OF PREPARATION, *is immediately apparent."*

Let us compare with this the letter which Villeneuve wrote to the Minister Decrès on January 7, 1805.

"My dear General, I have ceased to write you private letters because I have thought this method bothered you and I fear nothing so much as being a burden. I wrote thus to you on my arrival at Toulon and you did not answer me. It is true that I ask for money with good reasons, to which it suited you not to reply."

The likeness, as may be seen, is striking. To the too well founded remonstrances of Admiral Cervera, the Minister of Marine finds only these words of reply: *". . . . Your calcula-*

tions do not take account of the difference which exists between homogeneous crews, trained and disciplined, and the mercenaries of the United States."

We know this refrain; it has served and will again serve the ministers of all countries to make a sentimental and passionate diversion, instead of replying to often embarrassing questions as to the condition of the naval material.

To understand what it was worth in the case of Spain, it suffices to know a little anecdote which was related to me by a person worthy of belief, and which goes back to the acceptance trials of the *Cristobal Colon*. The trials of this cruiser, built by Ansaldo at Genoa, had been conducted by the constructor's men and had gone along most satisfactorily up to the time established by the contract when the machinery was to be put in charge of the ship's regular crew. On that day the watch of Spanish firemen had just replaced the contractor's men in the fire rooms, when the enticing sound of the signal for the crew's dinner was heard. With a touching unanimity, the firemen immediately abandoned their furnaces, powerless to resist the call to food and the provoking image of the cigarette which was to follow it. There was a *discipline* beyond the possibility of characterization.

The analogy to which I referred above is not merely accidental, it is complete. Villeneuve wrote again, on his return from the sortie from Toulon on January 18, 1805, in the letter from which I have already quoted: *"Fortune did not fail me on this occasion for if I had been sighted by the English squadron, it would have been impossible for me to escape it, and even with inferior forces, it would have completely routed us."*

And the following day he adds: *"I beg you to remember that I did not desire the command of this squadron . . . . I very earnestly pray that the Emperor may not commit any of his squadrons to the hazard of events . . . . I should be greatly pleased if the Emperor would relieve me from the command."* Later he was to write from Cadiz on August 22, 1805: *"I have been unable to perceive any good whatever in the campaign I was to undertake. I would pardon the whole world for casting stones at me; but naval people in Paris and in the bureaus who join in doing so will be very blind, very contemptible and above all very foolish."*

Cervera, likewise, despairs before he has made any trial; he makes numerical calculations showing the crushing superiority of

the Americans, he complains of the poverty of his ships, he proclaims the certainty of his defeat. Later, at Santiago, he will express, just as Villeneuve did, his indignation at the views of his colleagues in Madrid, as well as his desire to be replaced, to see *"the cup of responsibility taken from his lips,"* a terrible phrase, for it is the courage to take responsibility which makes great leaders; in fact, imitating his precursor, he does all things which can stifle what little moral force the Spanish navy may still have, but none of the things necessary to revive its flagging energies.

Admiral Cervera to General Blanco, Santiago, June 27: *"I am of opinion that there are many seamen more skilful than myself, and it is regrettable that one of them cannot come to take command of the squadron, in which I would remain as a subordinate."*

It is not for artistic effect that I have called attention to this curious parallel between two personalities of which one, after the lapse of a century, is the image of the other. What I have really aimed at is to bring into comparison two systems, or more exactly, for these two systems are one and the same, I have tried to bring out the fact that in different surroundings, times and circumstances, and with very different instruments, the same results were produced by the same cause, unpreparedness.

And in the two cases, in 1805 as well as in 1898, there exists, as a matter of fact, but *one single cause for the final disaster*, the absence of preparation for war, which betrays itself in the bad condition of ships, the lack of resources of all sorts, the poverty of the crews, their lack of instruction and training, and what may be summed up as military weakness.

CERVERA'S SQUADRON.

In Spain's case there was one more aggravation, and a tremendous one, at that. Villeneuve at least knew what his Emperor desired; he knew it only too well. We have considered at its proper place Napoleon's strategic plan, which had at least the immense merit of existing. As for Cervera, he, when setting out for the West Indies, is ignorant of the motives for his departure, does not know what is expected of him and of his squadron. Beyond doubt this is because his government was equally ignorant. All that part of the official correspondence which refers to the matter is worth recalling, to serve as a real lesson in affairs, a mournful lesson. "Cadiz, April 4, Admiral Cervera to the Min-

ister: *Having no instructions, it would seem well that I proceed to Madrid to obtain them and to fix upon a plan of campaign.*" And the Minister replies: "*In the midst of this international crisis, it is impossible to formulate anything precise.*"

What the Minister neglects to say is that it would be impossible to make a more explicit confession of incompetence. Thus in the councils of the Spanish government nothing was foreseen, nothing planned. The question was not even asked what should be done in case facts gave the lie to their optimistic anticipations. They let themselves be surprised by the war as by a sudden flash of lightning out of a clear sky. This is inexcusable, for the storm which then rumbled had been gathering slowly, beginning as a cloud at the opening of the century and growing day by day. It is therefore a very true saying that nations suffer only the misfortunes they deserve.

The unhappy admiral protests once more before leaving Cadiz: "*Allow me to insist upon the necessity of agreeing upon a general plan of campaign, in order to avoid fatal vacillations. The government doubtless has its plan, and it is indispensable that I should be informed of it, so as to be able to co-operate with it efficiently.*"

That the government's plan had no existence is beyond any doubt, and the reply made to the admiral proves it: "*The urgency of your departure prevents for the moment making known to you the plan which you ask for. You will have it in all its details a few days after your arrival at Cape Verd, by a steamer loaded with coal which will follow you.*"

What is there then more important than for the executor of the government's will to know at the crisis of the game what is expected of him and where he is to go? The shocking discrepancy between the great importance of war orders and their expedition by a collier shows well that the minister sheltered himself behind the dilatory formula *to-morrow*, as convenient for governments as for individuals in an embarrassing situation.

From the Cape Verd islands, Cervera returns again to the attack: "*I request precise instructions for the contingency of war not having been officially declared at my departure.*" And this was the incredible reply: "*I am unable to give you more precise instructions.*"

Finally, before definitely starting for the West Indies, the commander of the Spanish squadron writes anew, after complaining

of the poor condition of the ordnance: *"At the end of all there is neither plan nor agreement such as I have so much wished and vainly proposed . . . . and so already disaster is upon us."*

It might appear that I am wasting time in formulating comments of the nature of truisms concerning these official documents of a history written scarcely seven years ago. But when we think that less than six years after these events a nation, Russia, disposing of much more formidable resources than Spain, was to give to the astonished world the spectacle of the same blunders, of identical errors, of similar weaknesses, we must recognize that certain truths, however evident they may appear, have need to be repeated over and over again in order to be understood by nations that have not yet undergone the trial of war, or have forgotten its teachings.

In view of the fact that the principal Spanish force was so unfortunately constituted, it may well be asked, what could be the object of the government in sending it to the West Indies? Opposed to very much superior forces, this squadron evidently could not have any pretention to seizing upon command of the sea by force. Was it intended, then, to limit its rôle to a continuing threat against the American naval forces, and to employ it as a *fleet in being*, to adopt the expression first used by Admiral Torrington after the battle of Beachy Head, and used again with great good judgment by Mahan in his critical study of this very Spanish-American war? In principle, the use in war of the *fleet in being* is perfectly defensible for the weaker nation, and, for the matter of that, the squadron constituted as it was would have admirably played that part, if the real value of its units, which were all fast cruisers, had faithfully represented its theoretical value.

Unhappily this was very far from being the case; the speed of these four ships, splendid on paper, was purely fictitious, on account of the incapacity of the engine room and fireroom forces, as well as because the machinery had not been kept in proper repair. And that is not all; the essence of a *"fleet in being,"* its sole raison d'être, is its mobility; it is by this precious quality of being able to appear now at one point and now at another point of the theater of war that it constitutes a threat serious enough to paralyze any operations of wide scope on the part of its adversary.

The truth of this was exemplified on June 8, when the Ameri-

can expedition was ready to set sail for Santiago; for a telegram, bringing the information, quite untrue moreover, that a group of suspicious ships had been seen off the north coast of Cuba, was enough to cause the order to sail to be countermanded, so that the departure did not take place actually until six days later. The effect produced by this false news was so great that the government did not hesitate to order Sampson to send two of his battleships to Key West; as a matter of fact, however, the commander-in-chief of the naval forces did not obey this order, and he did well not to. But this mobility, this intensity of life is only possible nowadays during very short periods, at the ends of which, under penalty of breaking down, our modern ships are obliged, by the inexorable necessities of their constitutions, to return to port for supplies, in the shape of coal and renewals of all sorts. And this means, in the last analysis, that, for a "fleet in being," a base of operations, abundantly provided with the varied stores without which the war ships of the 20th century are but inanimate carcases, is at least as necessary as it is for an offensive fleet.

But there was no such base for Cervera's fleet. The most indispensable supply, coal, was so stingily measured out to him, that even before he had reached his destination, the Spanish government, through various channels, announced to the admiral by telegrams the successive sending of five thousand tons to Curaçao and of two English steamers, each carrying three thousand tons, to Martinique. Cervera never received them, and moreover it was too late; it is not when operations have begun, and everything is made difficult and complicated as a result of hostilities, that it becomes necessary to think of procuring necessary supplies; it is during the time of peace that it is useful to accumulate them at judiciously selected points. No one would think, in private life, of waiting till the storm bursts and the tempest begins to rage before building himself a shelter; it is during the prior period of fine weather that each one takes his precautions.

It does not seem any more difficult to admit that for this storm of war, more terrible than any other, it is wise to proceed in the same manner.

Thenceforth, what could be hoped for from this starveling squadron, on a fruitless chase after fuel; what reserve of energy was to be expected from the hunger stricken? If the choice of Santiago for the squadron's destination was a strategical error,

that was a fault of small moment and a consequence of the veritable error, that irreparable one which entailed the defeat of Spain —lack of preparation for war.

Certainly it would have been better had Cervera led his squadron to Havana, the attack upon which would have demanded from the American expeditionary forces a much greater effort than at Santiago, on account of the more important resources of every nature possessed by the former place, and which it is not excessive to estimate at fully ten thousand men; or even at Cienfuegos, which is connected by railroad with Havana. But one must not lose sight of the constant preoccupation of the Spanish admiral to get his forces into shape, and, in the absence of precise orders from his government, it was the port where he hoped to be able to do this the soonest and the easiest that he selected.

He intended, moreover, to set forth again on the very next day, his coal once aboard; but the difficulties of coaling prevented. There is in this example warning of the far reaching importance of having bases and coaling stations equipped with all necessary machinery and apparatus.

To appreciate the result of this unfortunate choice, we need only glance at a few quotations. On May 19, the very day of his arrival at Santiago, the admiral telegraphed to his Minister: *"I shall have need of more coal than there is in this port;"* and his chief of staff, Commander Concas, in the account which he wrote of the squadron's movements, expresses himself thus: *"We set to work taking in coal with frenzy; but everything is wanting, even baskets, and the difficulties are such that, even with the help of working parties of soldiers, we do no more than a hundred and fifty tons a day, and each ship, with fires out, burns from four to five tons in the same time."*

This truly is black despair, and despair is a poor counsellor.

On May 22, Cervera again telegraphed: *"There is not enough coal here to fill us up, but, if the collier which left Curaçao arrives, there will be some left over."*

Nothing is lacking to this distress, not even the hopeless watch, which, like Sister Ann's, catches no glimpse of that coal ever announced by the government and which never comes. At that very moment there were nearly thirty thousand tons at Havana, and this observation only makes the clearer Cervera's error in chosing Santiago.

This question of the best destination for the Spanish squadron has supplied material for numerous controversies; some have pretended that Santiago was well chosen because it removed the American action the furthest possible from their base of operations, Key West, while Havana was much nearer to it. Knowing as we do now what a poor leader Cervera was, we may well doubt the depth of intention which is attributed to him. The sole and only cause of his entry into Santiago was his anxious haste to coal, a desire shown also by his stopping at Martinique, and then at Curaçao, as he had anticipated before leaving Cape Verd, without allowing the state of war to modify in any way his plan. Having neither the means, nor the idea either, of resorting to scouting to obtain information as to the enemy's movements, he entered Santiago quite simply because that port was the first on his route.

It is himself who tells us so, moreover, for he wrote on May 25, to General Linares: *"It is regrettable that my bad luck brought me to this port which is so destitute of resources, and that I chose it thinking, since it had not been blockaded, that it would be well supplied with provisions, coal and various stores."*

All the more or less profound combinations which have been attributed to him are purely imaginary. I repeat it—Havana would have been much preferable, in spite of its proximity to Key West, not only because the squadron would have found there resources which did not exist elsewhere, but because by that course Spain would have brought about a *concentration* of her forces of all kinds. The governor of the island had an army at the seat of government, which his adversaries estimated at fifty thousand men, but which really could have been brought to twice that number. In estimating at one hundred thousand men the force which the Americans would have needed to reduce Havana, I believe I am really below the mark. I have the right to think so, and even to express some doubts as to their being successful at all, when I remember the many disgraceful events of the so much more modest expedition which was made against Santiago, the scenes of disorder when the expeditionary force was being assembled, and its singularly heterogeneous composition.

It is certainly curious to note that, if Cervera had made for Havana, or Cienfuegos, no hostile force would have been able to oppose his entrance, since neither Schley nor Sampson happened to be there the day when the Spanish division would have arrived.

By shutting himself up in Santiago, on the contrary, Cervera, completely destitute, by that very act put an end to his "fleet in being," and permitted the American fleet to possess itself of command of the sea by strictly blockading him there. After that it was at least as much the extreme distress which I have above explained as the criminal pressure from a government under the influence of I know not what political aim, ignorant of military necessities and devoid both of sincerity and intelligence, which determined the Spanish squadron to effect its heart-rending departure.

On May 24, after holding a council of war of his commanders, Cervera telegraphed to the minister: *"The squadron being ready to leave port to seek elsewhere supplies which are lacking here, I have consulted the commanding officers."* Their opinion being adverse to going out, on account of the reduced speed of the squadron (fourteen knots, due to the foul condition of the *Viscaya's* hull), they did not start, and on the next day found themselves blockaded. And it is necessary to state that, in the deliberations of the council of war, the possibility of fighting, even a partial engagement, or even of any military operation whatever, was never so much as glanced at. One single objective exists, flight towards another shelter. A sad state of mind which explains the defeat to come.

This thought is again found in the same letter to General Linares from which I have already quoted a passage: *"In thinking of the probable upshot of a blockade, I consider myself fortunate to be able thus to occupy the greatest part of the enemy's fleet, for it is the only service that can be expected of a squadron so small and so ill armed. I beg you to make these explanations known to the Captain-General, in order that he may understand the cause of my apparent inaction."*

What poverty of military understanding! And what a strange conception by which the act of kindly offering to an adversary, without a struggle, full liberty of movement and what we already understand as command of the sea, is made to appear as a service rendered to his own cause!

On May 25, the squadron has only provisions for one month, and on June 20 General Blanco telegraphs to the Minister of War: *"The entry of Cervera's squadron into Santiago and its stay there*

have completely changed both the objective of the campaign and its aspect, and thereby also the value of the provisions and coal on hand and the supplies of certain places . . . . It would be better perhaps to go to Cienfuegos or Havana, which is still possible, or even better to start for Spain; anything rather than to remain shut up in Santiago, exposed to the necessity of surrendering, starved out."

So then hunger is to chase the squadron from its refuge; but not hunger alone. Interferences from without, ill-omened as are all those which emanate from an authority far removed from the scene of events, are to drive forth, against its will, this unhappy squadron and to precipitate the inevitable disaster.

In this same letter from which I have just borrowed an extract the governor of Cuba asks for supreme authority over all the military forces of the island. This demand is beyond any doubt legitimate and conforms with the true principles of war as well as with the efficient use of forces, which requires an undivided authority to command them, but he only demands these powers to misuse them and *from a distance* to weigh upon the admiral.

"It is unfortunate," says General Blanco, *"that the independence enjoyed by Cervera's squadron has prevented my interfering with its movements, and I have suffered therefrom . . . . I respectfully suggest that this is a favorable moment for unifying military action in the present war by giving me the authority of commander-in-chief over all the land and sea forces on these shores."*

The ministerial despatch, conferring upon the governor the higher powers which he requested, is dated June 24, and on the following day the pressure begins by a despatch in cypher addressed to General Linares:

"I am of the opinion that he (Cervera) ought to set out as quickly as possible for the destination which he considers the most suitable, for his stay in port is the most dangerous of all things . . . . To lose the squadron without fighting would have a terrible effect in Spain and everywhere."

The accuracy of the final reflection is incontestable, but the responsibility for this lamentable result must rest upon a higher authority than the unfortunate admiral; more than anything else the improvidence of the Spanish government was responsible, an

improvidence which would be incredible were it not proven by official documents.

General Blanco returns to the charge, several times, on succeeding days, becoming each time more pressing and at last, having obtained the approval of the government at Madrid, giving the order to depart three times on July 1 and finally an imperative order on July 2.

To understand the exact extent of the pressure put on Cervera, it suffices to consider the words spoken at one of the meetings of the council of war of commanders of the Spanish squadron, that of May 26, by Commanders Bustamente and Concas. Both state that they believe in their soul and conscience that the government at Madrid *wishes the destruction* of the squadron, in order to have an excuse for concluding a peace.

"*It is necessary then,*" says Commander Concas, "*to go forth, not because it is reasonable, but because later on, under conditions probably worse, we shall without doubt receive a formal order to do so.*"

We have already had occasion to point out, in occurrences of war, certainly less serious than these, the pernicious influence experienced by the untimely interference of a central authority in the details of the conduct of war. In this tendency of governments to wish to direct operations from a great distance away, a tendency greatly accentuated by the facilities of all sorts which modern progress affords for the rapid transmission of orders, I perceive a great danger for the future. That is why I thought it right to revert to the subject. The true doctrine, without any possible doubt, is that formulated by Napoleon, and every general-in-chief who has proper understanding of his responsibilities ought to be guided by it.

Although in the domain of strategy the largest part of the errors committed must be blamed upon the Spanish government, the responsibility for the tactical errors of the desperate sortie from Santiago belongs wholly to Cervera. The official correspondence, with which we already are acquainted, has revealed to us the remarkable state of mind of the commander-in-chief of the Spanish squadron, as well as of most of his captains, relative to their departure; there was for them no question of fighting, selling their lives dearly, and at least offering to their poor country the alms of a little glory; their one thought was to flee.

This fixed idea may be discovered in a despatch from Cervera to the Minister, dated June 23: *"As it is absolutely impossible for the squadron to escape under these circumstances, I expect to make as good a resistance as possible, and then as a final resort to destroy my ships."*

The question is more and more, why did the Spanish send war ships to the West Indies when their commander perceived no other result than either flight or suicide? What then is a war ship, if it is not an instrument to fight with?

But in any case, assuming Cervera's point of view, that is to say, seeking to gain a better provisioned port than Santiago for the purpose of refitting, it is impossible to understand why he did not make that sortie at night. In the council of war of June 8, Commanders Bustamente and Concas had expressed the opinion that they should go out by night, taking advantage of the period of absence of the moon. On June 26, the government itself recommended to Cervera this night attempt; but such a manœuver is too bold for the poor weak soul of the commander-in-chief. It is the characteristic of his moral feebleness to evoke phantoms, to see difficulties everywhere. One night he ascends to the high battery of *Socapa,* and the sight of the American ships on the blockading line, with their search lights turned on the entrance, is sufficient to make him despair of any possible success. Those luminous rays, across the darkness, take in his fevered eyes the fantastic appearance of insurmountable barriers. Not once does he say to himself that a resolute attack is by itself a chance, that it necessarily produces in a line of blockade a disturbance from which advantage can be drawn, that a blockading ring by night is not so unyielding that it cannot be broken at one point and a sufficient disorder made there to prevent its reforming before an escape has been effected, that in such a disorder nothing is more like a friendly ship than a hostile one, and that this confusion profits above all the attack; finally that a night battle is too indefinite not to be advantageous to the weaker.

For him the chance of success remains hidden in the dark shadows of the night; but in revenge he perceives the difficulties, all the difficulties, as through magnifying glasses. The narrowness of the channel, which obliges the ships to go out one by one; the impossibility of passing through it under the blinding light of

the enemy's search lights without going aground; the opinion of the pilots that the *Colon's* draft makes his going out more difficult, etc.: all the pretexts are put forward and exaggerated to mask the sole true motive of the choice of going out by day.

And this motive is given to us by Cervera himself in his letter of justification of October 7, 1898, addressed from Madrid to General Blanco: *"Counting as I did, on a fatal disaster, my task was reduced to having the smallest possible number killed and to not leaving the ships in the hands of the enemy."* This letter was not published till 1900; but I have kept an exact remembrance of the quite accordant statement made early in 1899 in my presence, to the Minister of Marine, by a Spanish officer: *"We went out in broad daylight so as to let the greatest possible number of men save themselves when we ran aground."*

From this sample it may be seen that if Spain knew not how to prepare her material forces for war, neither was she any more foresighted as regards her moral forces. Let us pause for a moment over one last quotation, taken from Commander Concas' memoir, from the chapter devoted to the battle of Santiago: *"On the practical side of gunnery, the enemy, who for two years has been preparing for war, has had frequent exercises; moreover, the bombardments of Porto Rico, Santiago and Daiquiri have enabled him to correct the defects in his material.*

"For our part, the 28 c. m. guns have fired in all two rounds apiece and what is frightful, on account of the little confidence we have in our cartridges, the 14 c. m. guns have never been tested and their first rounds are to be fired at the enemy. Except that, our ships are in perfect condition and as regards training are second to none in any navy in the world."

To use one of this officer's own expressions, what is above all frightful is to find in his account this sort of testimonial given as to the material and moral condition of the squadron after having ascertained its destitution of all which constitutes preparedness for war. Except for the guns, except for gunnery and target practice, except for trained gunners, except *that*, all is well; but *that* is the whole of war, because war is settled by battle. With officers in such a state of mind, which is but the image of the national mind, a nation is ripe for defeat.

THE CONDUCT OF THE AMERICANS.

Hitherto I have entirely disregarded the part played by the Americans in the war; this because, as I have already pointed out, its final result is almost wholly due to Spain's weakness, and because, in my opinion, the complete lack of preparation of her military forces, using the term in its broadest sense, is a full explanation of the war. The superiority of the Americans, which in the main resulted from the poor quality of their adversaries, was made apparent by plans, often doubtful, and sometimes incorrect, from the point of view of the theory of war, but easily rectified under the most favorable circumstances.

On this account I have been unable to understand the great admiration which Commodore Dewey's operations in the Philippines evoked, in his own country particularly, but also in many other countries.

The naval forces once in sight of each other, the disproportion was such that their encounter could only be butchery, not battle. Between the modern protected cruisers of the American squadron, of high speed and armed with powerful guns of 8-inch and 6-inch caliber, and the old fashioned Spanish ships, without speed or armament (for the *Reina Christina* alone had 16 cm. guns, the others having nothing bigger than 13 cm. and 12 cm.), the struggle was too unequal for the issue to be doubtful.

The battle of Cavite, therefore, has very little interest for us, and I shall confine my examination of it to a single brief observation. As though there were not enough elements of weakness in the very constitution of his fleet, Admiral Montojo added to them another, worse than all the rest, by awaiting at anchor the enemy's approach. He had forgotten Aboukir, or rather he exhibited, like so many others before him, the incurable physical and moral inactivity of the weak.

It was simple: the Americans, having retained their ability to manœuver, passed back and forth in column before the anchorage, at the distance they had chosen and which they controlled, with their guns playing on the Spanish ships. It was a target practice, a gunnery exercise with stationary target, and here again the true lesson to be learned from this encounter concerns the inveterate weakness of the Spanish sailors much more than the strength of their opponents.

In the matter of the armed intervention of the Americans in the Philippines, on the other hand, there is much of interest to be said, for in that a fundamental principle of strategy is concerned.

The utility of operations in the Far East was more than doubtful. It must not be lost sight of, in fact, that the precise object of the war was the success of the century-old politics of the United States in *Cuba;* it had no other object. Every measure capable of endangering the success of operations in Cuban waters was therefore essentially bad; and such was the maintenance in the Philippines of a not inconsiderable part of the American naval forces, which, violating the principle of concentration of forces, weakened, without any advantage, the military action in the chief scene of the theater of war.[1]

Doubtless, against such weakness of mind and body as were Spain's, much could be permitted; but organisms which are the most exhausted by sickness sometimes have redoubtable death struggles. If, instead of sending four forlorn unhappy ships to the West Indies, under the orders of a new Villeneuve, Spain had placed all her available forces in the hands of an enterprising chief, to lead them to the West Indies and there to sell dearly the honor of the Spanish arms, the United States would have had none too great a force to make head against them and finally conquer. Therefore it was in the West Indian seas that Dewey's squadron should have been and not anywhere else.

To judge still better the question, it suffices to observe that all the military successes possible in the Philippines would have had no sort of effect upon the issue, if the arms of the United States had been unable to triumph in Cuba. The operations at the latter point were the only ones which answered to the aims of the war, and it was their success, consummated by the destruction of Cervera's fleet, which brought about peace, on the conqueror's terms;

[1] The author's conclusions are based upon his wholly mistaken belief that the United States anticipated war with Spain and prepared for it in advance. As a matter of fact, war was precipitated by the destruction of the *Maine* in Havana Harbor, and its sudden outbreak found a considerable part of the United States naval forces carrying on the usual duties of peace-time on the Asiatic Station. Under the circumstances it was hardly possible to do anything else but attack the Spanish forces in the Philippines. As regards this performance it may, at least, be said that Commodore Dewey did what he set out to do and did it as thoroughly as Nelson, Sufferen, or anybody else could have done it.—TRANSLATOR.

they would have equally entailed the surrender of the Philippines by Spain *if not a shot had been fired there.*

This does not merely demonstrate the strategical error of the Americans; it also lays bare the absurdity of the Camara undertaking, which never got beyond Suez; and, from a quite general point of view, calls attention to the pressing need of not having a scattering of objectives but, on the contrary, knowing how to choose from the always complicated grouping of interests in the vast field of war the one which is the most important.

Apropos of monitors, which he very rightly condemns, Mahan has very happily recalled, in his work, *Lessons of the War with Spain,* a splendid maxim of Napoleon which the American author considers to be *pregnant of the whole art and practice of war.* It applies even better, in my opinion, to what we have just seen of the strategic plans of the Spanish-American war. It is this *"Exclusiveness of purpose is the secret of great successes and of great operations."*

Dewey's cruisers would have been so much the more useful in the West Indian sea because, as Mahan very clearly shows, the lookout and scouting service of the American squadrons was very defective. Thus it is that Cervera's squadron was able to gain Curaçao and Santiago without being sighted by the American cruisers, even though notice of its appearance off Martinique had been telegraphed on May 12 to the United States government from the auxiliary cruiser *Harvard,* which was undergoing repairs at Fort de France. Even more, the Spanish squadron entered Santiago on the 19th, and it was not until the 26th that Commodore Schley established the blockade of that port; nor did he obtain from spies exact information of the actual presence of Spanish ships in the harbor till some days later.

Yet it would have been very advantageous to the American naval forces to have come into contact with the Spanish squadron at the earliest possible moment. The battleship *Oregon,* having started from San Francisco before the declaration of war, arrived in the Atlantic in the midst of the hostilities. As she had left Bahia on May 9, while the Spanish squadron was to the southward of Martinique on the 10th, an attack upon this single vessel by the very superior forces of the enemy was possible and to be feared. Her destruction or capture would have been a very appreciable loss to the American navy, not only as being a notable weak-

ening of military strength, the battleship in question constituting a very powerful fighting unit, but still more on account of the moral effect upon the whole nation.

I have just said that this attempt on the part of Cervera was to be feared; such was the very firm opinion of Mahan himself. Hence re-enforcements should have been sent to meet the American battleship, keeping a close watch upon the movements of the Spanish squadron; or more exactly, for this would have been much the most decisive aid to bring to the *Oregon*, it was needful to get in touch with the hostile naval force, to fight and destroy it, in a word to cling to what the learned American writer himself calls "*the great objective which dominates all others and replaces them, the hostile naval force, when a reasonable chance offers of destroying it or one of its powerful parts.*"

The same author explains the abstention of the government at Washington from initiating a strategical operation logically called for, as due to fear of newspaper indiscretions. This very weak explanation would be surprising from the pen of so wise a writer, if the perception of his natural indulgence regarding the errors of his own country did not explain why he believed it proper to throw a veil over the real motives. And these motives arose almost wholly from a scarcity of cruisers, which once again rendered the organization of search and scouting very difficult.

The timidity of their adversaries, whose plans never for an instant were directed towards offensive action, even when they had a great superiority of force, as in the exceptional case of the *Oregon*, nullified the possible consequences of this error; nevertheless it was an error.

As a matter of fact, the American navy during this critical period could only appropriate to the scouting service four auxiliary cruisers, the *St. Louis, St. Paul, Harvard* and *Yale*, and two regular cruisers, the *Minneapolis* and *Columbia*. It was a small force with which to cover the approaches to the West Indies, and all the places where Cervera might appear. Thus the Navy Department was obliged to have recourse to torpedo boats for picket service, and this, according to Mahan himself, "*to the great hurt of their engines, not intended for long-continued high exertion, and to their own consequent injury for their particular duties.*"

I have underlined purposely part of the preceding paragraph, for it is not the American navy alone that deserves to be re-

proached with giving employment for which they are not at all suitable to vessels of small tonnage "*liable to serious retardation in a seaway,*" and with thus forgetting the application of the principle of specialization in warfare.

THE BLOCKADE OF SANTIAGO.

That simulacrum of naval force, Cervera's squadron, having taken refuge in Santiago, the problem became a very simple one.

Taking inspiration, according to Mahan, "*from the true general principle that the enemy's fleet, if there is any probable way of getting at it, is the objective which takes precedence of all others, because control of the sea by the overthrow of the hostile navy is the determining factor in naval warfare,*" there was nothing left to do but institute a close blockade.

The beginning of this blockade is also the beginning of really correct operations on the part of the United States naval forces. It is interesting to reproduce some of Admiral Sampson's orders, which will be read with profit provided the particular and exceptional circumstances under which they were written, as well as the far too unaggressive character of the defence, be not for a moment lost sight of.

The admiral had divided his forces into two squadrons, keeping command of the first and giving the second to Commodore Schley.

June 2, 1898: "*The vessels will blockade Santiago de Cuba closely, keeping about six miles from the Morro in the daytime, and closing in at night, the lighter vessels well in shore. The first squadron will blockade on the east side of the port, and the second squadron on the west side. If the enemy tries to escape, the ships must close and engage as soon as possible, and endeavor to sink his vessels or force them to run ashore in the channel. It is not considered that the shore batteries are of sufficient power to do any material injury to battleships.*

"*In smooth weather the vessels will coal on station. If withdrawn to coal elsewhere or for other duty, the blockading vessels on either side will cover the angle thus left vacant.*"

The characteristic of this order is the feeling which it reflects of absolute security from any demonstration whatever on the part of the enemy; it is much more like an order concerning an exercise of times of peace than a war-time order. The admiral

who signed it could certainly afford to do so, for so far as the batteries in particular are concerned, we find justification in the letter already referred to from Cervera to General Blanco written from Madrid: *"Santiago was without artillery, in the modern sense of the word. Except for the guns of the Mercedes, mounted in the Socapa and Punta-Gorda batteries, there were only two 9 c. m. Krupp guns; useless against ships, and some howitzers and obsolete guns; so the enemy approached without fear, coming very close at night and taking stations around the entrance."* Does not the mere fact of coaling on station indicate the full measure of a quite justifiable confidence.

"Order No. 13, June 7, 1898. After careful consideration of the various schemes of maintaining an effective blockade of Santiago de Cuba at night which have been advanced, I have decided upon the following, which will be maintained until further orders:

"The weather permitting, three (3) picket launches detailed from the ships of the squadron each evening, will occupy positions 1 mile from the Morro—one to the eastward, one to the westward, and one to the southward of the harbor entrance. On a circle drawn with a radius of two miles from the Morro will be stationed three vessels, the Vixen to the westward, from one-half mile to 1 mile from the shore, the Suwance south of the Morro, and the Dolphin to the eastward, between one-half mile and 1 mile from the shore. The remaining vessels will retain the positions already occupied, but they will take especial care to keep within a 4-mile circle.

"All vessels may turn their engines whenever desirable to keep them in readiness for immediate use, and while so doing may turn in a small circle, but without losing proper bearing or distance.

"The signal for an enemy will be two red Very signals burned in rapid succession. If the enemy is a torpedo-boat these two red lights will be followed by a green one.

"I again call attention to the absolute necessity of a close blockade of this port, especially at night and in bad weather. In the daytime, if clear, the distance shall not be greater than 6 miles; at night or in thick weather, not more than 4 miles. The end to be attained justifies the risk of torpedo attacks and that risk must be taken. The escape of the Spanish vessels at this juncture would be a serious blow to our prestige and to a speedy end of the war."

In carefully reading this order, one would think himself in a

dream, and the mind inevitably reverts to those squadron exercises in which certain accepted hypotheses are unreal because the conditions of war are only feigned. But this concerns reality. In what peace-time exercises would one dare to allow as practicable such a stationing of three small boats, and the placing of ships on a line of blockade at so short a distance from the shore? Yet these were operations against an enemy. But what an enemy! It would seem impossible to imagine that one so easy to deal with could ever be found, if an actual example had not just shown us that passive fatalism can be found among all races. Lacking cannon, are there not then torpedos or torpedo-boats at Santiago, to forbid to the blockaders so reckless an attitude? No, there is *nothing*, and Cervera himself tells us so under date of June 20:[8] *"Six sevenths of the 14 c. m. ammunition is unserviceable; the primers are unreliable and there are no torpedoes. These are the principal needs."*

This official Spanish correspondence truly contains terrible ironies: *These are the principal needs.* But, if those needs are not supplied, it is life which departs, for they are the very soul of the struggle. If there are neither cannon nor torpedoes, at least Santiago still holds men, rifles and boats; they might attempt to take by assault those three American boats, were it only to take up the constant gage of which they are the symbol. But for this it is necessary to act, and the Spaniards dread action. It is therefore very true that Sampson has nothing more to worry about; for him have been fashioned adversaries who, as I have already observed, constitute by their own weakness nine-tenths of his strength and with their own hands prepare for him victory.

As it is absolutely inadmissible to count upon similar chances in the future, I should not have dwelt upon the dispositions taken in the blockade of Santiago, if I had not thought it useful to show once more to what a lamentable degree of feebleness a country may attain when it has not long and painstakingly prepared for war.

Others of Sampson's orders prescribe the use of search lights to illuminate the entrance of the channel, and regulate their employment as well as the method of keeping watch of the ships; finally they reduce to four miles the station distance.

[8] The correct date is June 22.— TRANSLATOR.

This period of blockade, a true blockade of "petty warfare," furnishes matter for but two useful observations. The American squadron conducted numerous bombardments, expending ammunition to no account; just as in an operation of the same kind, and a perfectly useless one, previously carried on at San Juan, they obtained no results of value. And yet there was no energetic response to interfere with the bombarding gunfire. The Spanish forts, so ill equipped, replied little or not at all. What should be remembered is the waste of ammunition, out of all proportion with the result to be expected, which an attack by ships upon coast batteries entails, when the latter are sufficiently elevated, as at Santiago.

The second fact relates to the *Merrimac's* attempt to "bottle up" the Spanish squadron. It is interesting because it was the first of the kind, those more numerous attempts which we shall have occasion to note in studying the blockade of Port Arthur having been modeled upon it. Though it failed, for the sunken wreck on one side of the channel has never prevented the navigation of the passage, the principle itself of the attempt is a serious argument against naval ports with a single entrance or too narrow a one, and a warning in any event to provide for them an outer watch and defence service rendering any sort of surprise impossible. Without any doubt, such an operation is extremely delicate, and this is proved by the fact that the gallant Lieutenant Hobson, despite exceptional circumstances, never likely to arise again, which allowed him to reach the narrowest part of the passage without being seriously interfered with, was unable to succeed. But the luck may be better another time, and the accident of success is so much to be dreaded that too many precautions cannot be taken to prevent it.

Of the military expedition from Tampa to Santiago, I shall say nothing here. Of a truth it would not be well to seek there anything to imitate, but much rather examples to avoid. In this connection a new proof may be found of the *wholly relative* value of superiority of forces. Against a nation less inactive than Spain, less *flabby*, according to President Roosevelt's strong expression, there would have been great probabilities of a radical change of fortune in this war to the prejudice of the Americans.

I have gathered from the lips of a Frenchman present in Santiago during the whole siege some striking facts regarding the

respective situations of the two armies. At the moment of Santiago's capitulation, the Spanish troops still had ammunition and rations for six months; on the American side yellow fever had already produced such ravages that the volunteers of the expeditionary force were arrogantly demanding to be sent home. To explain under these conditions the unexpected denouement, now a matter of history, it is necessary to refrain from attributing it to the military forces, and to recollect that effective strength in war is not composed of material forces alone; it also comprises financial forces, visible or concealed.

THE SORTIE OF THE SPANISH SQUADRON.

I come to the decisive moment; the attempt of Cervera's squadron to escape from Santiago. It would be superfluous to enumerate all the details of this sortie, or more exactly this flight.

Where there is no intention of fighting, at least on one side, there cannot be matter for a tactical discussion; what the manœuver was is well known, the passing out of the Spanish cruisers in column; the despairing flight to the westward, at much reduced speed (less than fourteen knots) for theoretically fast ships, since battleships like the *Oregon* gained on them; finally the voluntary running ashore.

The action was neither more nor less than a target practice carried on by the American ships against a moving target, with scarcely more risks than those of a gunnery drill; this needs no further proof than the very statements of Sampson's official report, which establish the fact that less than a quarter of an hour after their exit from the passage, the *Infanta Maria Teresa* and the *Oquendo* had already ceased firing on account of being on fire; that the *total* losses in the United States fleet in this affair were *one* killed and *two* wounded, all on board the *Brooklyn;* and finally that *the Spanish gunners were as bad as possible.*

The American gunners, on the contrary, were very well trained. It is all the more useful to examine what the practical results of firing under such eminently favorable conditions were; it is not often that gun captains are so lucky as to have real ships for their target, and the lesson will be a profitable one.

The range varied between two thousand and four thousand meters. The number of projectiles of all calibers fired by the Americans can be estimated at six thousand; out of that immense

number there were only one hundred and thirty hits, which gives the very small percentage of 2.2. There is nothing in this which ought to surprise us, and I am not making these statements merely to recall figures which complete and verify the theoretical probabilities. But among the very various calibers used, eight 13-inch guns gave not a single hit, six 12-inch gave but two hits, and eight 8-inch only ten hits; all the rest of the hits came from the fire of the medium and light guns.

Upon this point, there is a very important remark to be made; when the comparative ballistic value of different guns is discussed, a relation is established between the effects of their projectiles, *supposing them to have struck the target.* Thus proposed, the problem is vitiated from the start, because it does not take account of the chances of hitting, which are strictly proportional to the number of shots fired and consequently to the number of rounds carried. But this number of rounds carried, and the resultant ability to fire a considerable number of shots, as well as the chances of hitting the target, are generally and in all navies, from considerations of weight and space which it is useless to inquire into, so much the smaller as caliber is greater. Such is the sole and correct explanation of the results given above. At the same time it is a complete demonstration of the error committed in adopting a diversity of calibers and giving fighting ships a very small number of big guns, theoretically of great power, but too ill supplied with ammunition to be reasonably sure of making a hit.

This is not all: of the one hundred and thirty hits counted upon the hulls of the Spanish ships, not one affected their buoyancy, not one reached their underwater parts, not to mention their essential organs; their machinery remained intact. And yet these instruments of battle had exceeded, long before the firing ceased, the limit of their resistance. Devoured by fire, having all their upper works torn to pieces, their guns destroyed, the ammunition hoists broken down, the means of communication cut, the fire mains riddled, they were no more than defenceless wrecks when they ran ashore.

Thus, without going back to the naval battles of sailing ships, following Punta-Agamos and Yalu, Santiago showed once again to the naval world what the battle of August 10 and especially that of Tsushima later on confirmed, that it is not at all necessary to sink and completely destroy a fighting ship to force its surrender,

but that this result is much more surely obtained by riddling that part of the target which almost all the successful shots hit, thus reaching the field of action of the personnel and so destroying the force of resistance of that personnel. It proves furthermore that it would be foolish in any case to base offensive action upon the hope of striking a single limited part of the target which by its very narrowness escapes being hit.

I will add in conclusion that the demonstration of Santiago is still more convincing than all the others, because the enemy did not defend himself, and the American gunners, in full possession of their faculties, found themselves placed in extraordinarily favorable conditions.

Next in importance to the disastrous consequences which absence of preparation for war entails, this is the most important lesson to be learned from the Spanish-American war. By itself alone it would justify the study of that war.

THE POPULAR OPINION OF THE FUNCTION OF FLEETS.

There only remains, in conclusion, to give due consideration to an absolutely erroneous popular conception which manifested itself with singular persistency in both of the belligerent nations during this war, and which it is the more necessary to combat because of its dangerous consequences and particularly because it is far from being peculiar to those two countries. To some extent everywhere in the world, except in England, public opinion sees in squadrons a system of defence for the coasts and the national domain. It is in an endeavor to destroy this false idea of the proper use of naval forces that I think it needful to elucidate this question.

On the Spanish side documents are not wanting to make clear the existence of this particular state of mind; we find it first in a despatch from the governor of Cuba under date of April 7, 1898: *"Public opinion is disquieted by the absence of any naval force. You will appreciate the favorable effect which would be produced by sending some war ships here."*

The vague instructions which Cervera received at St. Vincent contained also the following phrase: *"If war is declared, your objective will be the defence of Porto Rico."* General Blanco repeated his request on April 22: *"The enthusiasm here is great, but I fear a painful reaction if it is learned that the squadron is*

not to come. May I hope to see it arrive within a reasonable time?" The governor of Porto Rico had himself also telegraphed to the government two days earlier: *"I am ignorant of the whereabouts of the squadron. You know how scanty my resources are, and it would be well that we should be informed as to what our naval forces are doing."*

Finally, on May 17 and 18, having learned of an order sent to Cervera on the 12th, to turn back to Spain with his squadron, an order which the latter only knew of when he returned to Spain after the war, the governors of Cuba and Porto Rico made a further vehement protest against this decision.

On the side of the American people, the error is the same. It is Mahan himself, and his testimony cannot be doubted by anyone, who is to inform us upon this point. *"Our sea-coast was in a condition of unreasoning panic, and fought to have little squadrons scattered along it everywhere, according to the theory of defence always favored by stupid terror."*

Speaking of the effect produced in America by the announcement of the departure from Spain of Cervera's squadron, he says further, and I ask all to ponder his serious words:

"By some of the latter (the inhabitants), indeed, were displayed evidences of panic unworthy of men, unmeasured, irreflective, and therefore irrational; due largely, it is to be feared, to that false gospel of peace which preaches it for the physical comfort and ease of mind attendant; and in its argument against war strives to smother righteous indignation or noble ideals by appealing to the fear of loss—casting the pearls of peace before the swine of self interest."

The blind belief of public opinion, in America as well as in Spain, in the purely defensive rôle of fighting fleets appears with perfect clearness from the documents just exhibited. In that expression: *little squadrons scattered everywhere along the coast,* may be found condensed an idea so general, and still so wide spread, that it can be considered the expression of a universal public sentiment.

It is in obedience to this influence that the "flying squadron" of Commodore Schley was kept on the United States coast, contrary to the fundamental principle of concentration of forces, until the "fleet in being" of Cervera committed suicide by shutting itself up in Santiago.

It is because this feeling is so strongly rooted in the mind of the great masses of the people that it is necessary to strive to combat it by every means. That the task is a difficult one cannot be denied, because there exist in the body of the people very few of a character capable of elevating themselves to a point of general view, and of turning their regards from isolated facts so as to perceive only the general trend of events.

The enemy appears at some point on the coast, fires a few shots at the shore, demolishes some villages, even burns a commercial port. The instinctive, irresistible action of the people under the pressure of private interests which are menaced, is to demand aid and protection from the central authority; and the most efficient mode of protection unconsciously takes the form in their minds of that sort of floating and moveable *fort* which a fighting ship is.

Throughout the ages, the same story is told over and over again. To-day, the same as at the battle of Arbela, the question being between the immediate and accessory defence of some baggage and the quest of victory, we must decide whether we ought to take as objective the impossible task of succoring all the secondary ports threatened with some partial depredation, or whether we ought to pursue, as a unique and exclusive end, the destruction of the active forces of the enemy.

Our choice is already made, for we cannot forget that, among many other examples which we might have selected, England was saved from invasion at Trafalgar. That cape is not situated, to my knowledge, on the British shores.

A fleet is an offensive weapon, and the best method of defending oneself that has ever yet been found is by attacking.

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THE QUESTION OF SPEED IN BATTLESHIPS.

By ENSIGN R. R. RIGGS, U. S. Navy.

The military elements of a battleship may roughly be divided into three groups, guns, armor, and speed: coal capacity and supply of ammunition fall naturally under one or the other of these heads. On any given displacement, one or more of these elements must be sacrificed, as is exemplified by the multiplicity of types of ships in our own and foreign navies, as battleships, armored cruisers, scouts, destroyers, and now a type of battle-cruiser, the *Invincibles*. In each type certain definite ends have been striven for, and no ship combines all the good qualities of every other type. The problem has been, and still is, how far shall one element be sacrificed to attain superiority in the others? In two fleets of the same gun power and armor, the faster fleet would have an undoubted advantage, but, assuming that these fleets are equally well designed, this superiority in speed, with equality in everything else, can only be attained by an increase in displacement, with consequent increase in cost of building and maintenance. The problem narrows down to—cannot this increase in displacement be better utilized in guns and armor?

Speed is the most unreliable of these three elements: foul bottoms, poor coal, green firemen, accidents to boilers or steam line, minor accidents to engines, hot bearings, damage to stacks in battle, damage to hull by shells or torpedoes, or any one of a thousand things may neutralize a superiority in speed when the crucial time arrives. In some of the late British maneuvers, over half the battleships had to return to port on account of accidents to machinery, in a period of only two weeks, and this took no account of the hazards of battle. It may be argued that the slower fleet is just as liable to these accidents as the faster; true, but the slower fleet, if equally numerous and of the same displace-

ments, must still retain its superiority in guns and armor, while if the faster fleet loose the advantage of speed, it is outclassed at all points and must be defeated. And this risk increases in proportion to the number of ships engaged, for there is just so much more chance of one ship being winged, and the speed of the fleet must be the speed of the slowest ship. This is one place where concentration of fire, aside from any technical considerations, is advantageous. If two ships are engaged with two others, and one pair concentrates its fire on one of the opposing ships, the total damage to each side in a given time will be equal, but the ship on which the fire of one side is concentrated will receive *all* the damage on her side and so will loose speed twice as rapidly as her opponents. Her faster consort must either slow to her speed, with no compensating gain, or else abandon her, and expose herself to a similar concentration. If ten ships are engaged on each side, this must take place five times as soon, and if they are of equal size, the slower will be consequently stronger in guns and armor, and so receive less damage than they inflict. Any damage to the battery and armor of the slower fleet is not open to the same objection, for it is local, and the damage to one gun or ship in no way affects the other guns or ships.

It is frequently stated that the Russo-Japanese war illustrates the need of great speed for battleships, and this at the first glance appears to be true; but if the underlying principles are carefully studied, the fallacy of this is discovered. For example, at the battle of Tsushima, the Japanese fleet made about 15 knots to the Russians' 9 knots, and the Japanese won. But how much of the victory was due to speed, and how much to gun-fire? Had the fleets been equally well handled, and had the Japanese obtained their superiority in speed *at the expense of superiority in guns and armor,* would they still have won? That is the real point at issue. I think that no one will doubt that the result would have been the same had the Japanese not had the advantage of speed; it was this advantage *together with* superiority of gun-fire that made the victory so complete. As stated above, superiority in speed for a fleet in other respects equal to the enemy is of undoubted advantage, but should superiority in guns and armor be sacrificed for it? Another point shown by this battle. The Russian fleet was able to steam at 15 knots on leaving the Baltic, but it could make but 9 knots when the time arrived to use it, and

Rozhestvensky's division of new 18-knot battleships could make but 11 knots on a spurt. Does not this illustrate the unreliability of speed when operating at long distances from a base? Do we find any similar deterioration in the battery or armor? These last were at least as good as when they left Russia. Furthermore, the Japanese armored cruisers were used in the line of battle, and had to reduce their speed to that of the battleships. Would not this extra weight given to speed which could not be used have been better utilized in guns and armor? To be sure, Rozhestvensky attributed the Japanese victory to their superior speed, but he would be likely to assign any but the real cause to his defeat. If the crews could have been exchanged, which would have won, Japanese ships or Japanese personnel? Admiral Nebogatoff says that he surrendered because the superiority of the Japanese in speed enabled them to keep outside the range of his guns, and bombard him. Does not this show above all other things that the Russians were inferior in gun-fire as well as in speed? It should have been impossible for the Japanese to keep without the range of his guns and still do him any damage.

In the battle of August 10, the Japanese concentrated on the *Cesarevitch,* and she is found after the battle with her speed reduced to but 4 knots, and her coal consumption so high that she was unable to get back to Port Arthur and had to be interned at Tsingtau. Her heavy armor, however, was intact, though struck twelve times by 12-inch shells, and almost all her guns were serviceable. The *Mikasa* had suffered from a similar concentration and was compelled to stop for over an hour to repair damage to her machinery; a fine example of the unreliability of speed, and the danger it is subject to from concentration.

A still more notable example occurred four days later, August 14. On this date the *Rossia, Gromoboi,* and *Rurik,* under Admiral Yessen, met and fought a Japanese squadron under Admiral Kamimura, to the northward of Tsushima. The Japanese concentrated on the *Rurik,* and she was soon so damaged below the water-line and in her steering gear that she was unable to keep up with her consorts and was left behind. Admiral Kamimura continued the pursuit of the *Rossia* and *Gromoboi* with his armored cruisers, leaving the *Naniwa* and *Takachiho* to engage the *Rurik,* but seeing that he was unable to overtake them, he returned to finish the *Rurik.* Admiral Sir Cyprian Bridge, R. N., in speaking

of this stage of the fight says: "Though the latter's (*Rurik's*) steering-gear was damaged and her speed reduced owing to the water she had made through the shot hole below the water-line, she was still able to use her guns. How far her battery was serviceable at that stage of the fight is not certain. Admiral Yessen, judging from his report, seems to have been convinced that her guns were in a state to enable her to repel the attack of the *Naniwa* and *Takachiho*. Admiral Kamimura was of the same opinion."[1] The points to be noted are these: the 23 knots of the *Tokiwa* or the 22 knots and 21.7 knots of the *Idzumo* and *Iwate* did not enable them to overtake the 20-knot *Rossia* and *Gromoboi*, nor did the 20 knots of the *Rurik* enable her to escape from the 18.7-knot *Naniwa* and *Takachiho*, though her armament remained practically unimpaired.

Captain Rudolf von Labrès, of the Austrian navy, in speaking of the battle of Tsushima, says: "If the Japanese fleet had not been constituted of swifter vessels than the enemy, the latter would have *escaped* to Vladivostok; and in the same way, if a British squadron wishes to bring a weaker squadron to action, it must consist, not only of more powerful ships, but of swifter ships."[2] Here is the same fallacy. The slower fleet is assumed to be the weaker, and to want to *escape*, while as a matter of fact, other things being equal, it must be the stronger.

Take as a concrete example, a battleship matched against an armored cruiser, as for instance the *Virginia* against the *Washington*. Here the displacements are nearly equal, the date is about the same, and as they were designed by the same board they may be assumed to be equally well designed. The latter is nothing in the world but a battleship in which guns and armor have been sacrificed for three knots' speed. The broadside fire of the *Virginia* is four 12-inch, six 8-inch, and six 6-inch guns against four 10-inch, and eight 6-inch in the *Washington*. We see it stated that the faster ship can regulate the range to suit herself. Can anyone hope so to regulate this range that the *Washington's* battery can do more damage to her adversary's 11-inch belt and 6-inch side and diagonal armor than the *Virginia's* can do to her opponent's 5-inch belt and side? The faster ship would probably be winged long before she got within range for her 6-inch battery.

[1] Naval Annual, 1906, p. 149.

[2] Mitteilungen aus dem Gebiete des Seewesens.

It is very doubtful if an armored cruiser of the *Colorado* class would dare tackle even a monitor, for fear that one of the latter's shot *might* hit a vital spot, and if it did she would lose her only raison d'être, for a crippled cruiser would be useless as a cruiser, and still not "fit to lie in the line." In the late war, the greatest respect was paid to the *Kasuga*, with her one 10-inch gun, by the large Russian cruisers, not because they doubted their ability to defeat her, but for fear that in so doing they would have their own speed injured, and so be useless. It may be urged that an armored cruiser was never intended to fight a battleship. Then what *is* she intended for? Surely not as a scout or a commerce destroyer, for vessels of a fifth the displacement could do this work as well, and numbers are required here, not strength. The cost of a sufficient number of armored cruisers for such purposes would be prohibitive. If she is to overtake a weaker enemy, you must first assume a much smaller enemy, otherwise she could not have superiority in both speed and strength. By escaping from a stronger enemy she will never win wars. History teaches that it is only by the shock of armed fleets (or armies) that this is done. As Captain René Daveluy says, "quand on se bat, on doit songer à attaquer avant de chercher à se défendre, et on ne doit se défendre que dans le mesure qui permet à la défensive de seconder l'offensive."[3] In regard to armored cruisers running down weaker opponents, Admiral Bridge says, "It is highly instructive to find that the chief reason for constructing armored cruisers of great size, viz., that they may be individually superior to any antagonist likely to be encountered, has received no justification from the experience of either side during the recent campaign. Both sides unanimously adhered to the practice of grouping their armored cruisers in squadrons, and neither cared to trust any of them on a cruise alone."[4] Armored cruisers have been used here as illustrations, for they are nothing but battleships in which guns and armor have been sacrificed for speed, and the name is immaterial. Every argument used against them holds good against the battle-cruisers of the *Invincible* type, except that the latter, if wounded, would be fit to lie in the line, owing to her great armament. If it is hoped to fight at such great ranges that her 7-inch

[3] Étude sur le Combat Naval, p. 8.

[4] Naval Annual, 1905, p. 147. This grouping also correspondingly increases the chance of at least one of the ships being winged.

belt and 5-inch side will be of value, then the armor of battleships is wrong, not in principle, but in distribution.

If naval wars are, as history teaches, not to be decided by skirmishing or cross-raiding, but by one or more pitched battles, then every nerve should be strained, both in peace and war, to prepare for these *battles*. As armored cruisers have been shown not to be as valuable for this purpose as are battleships of the same size, they are a mistake. If this mistake has been made in the past then there is all the more reason for avoiding it in the future and this will not be done by repeating the error—the sacrifice of strength for great speed—in another form or under another name. I don't mean to say that very high speed is not valuable in its place, but putting it in large, imperfectly armed vessels is, as Jane says, "like putting all the eggs in one basket and putting the basket out to be kicked." Contrary to strength, speed must be distributed through as many units as is practicable.

Speed is not an arm, but only a means of employing arms. Captain Daveluy, already quoted, says, "La vitesse n'est pas une arme; . . . . on ne peut substituer aux armes un élément qui n'est que leur auxiliaire. La vitesse, en effet, ne procure pas un bonheur sans mélange: elle pèse lourd et elle coûte cher."[5]

Speed is often compared to the old weather gage, but the fallacy is that the latter was obtained without sacrificing strength, while the former cannot be. Is there a case on record where a single gun was thrown overboard to obtain this weather gage, and if it had been necessary to sacrifice a fifth or a quarter of the battery would the English admirals have striven so for it?

Most arguments in favor of speed are simply bald statements that superior speed is of undoubted value, or that, other things being equal, the faster fleet has such-and-such advantages, forgetting that if other things are equal, the faster fleet *must* be the weaker. Also, as shown by the examples given above, and many others, the faster fleet on paper may easily be the slower on the day of battle, but the stronger fleet is reasonably sure of this superiority regardless of time or place. Admiral Sir Edmund Fremantle, R. N., says, "I feel confident that no theoretical arguments would make a British admiral content to command a fleet which had a speed of, say, 2 knots less than that of his enemy," but suppose this inferiority of speed *at the beginning* of the battle

[5] Étude sur le Combat Naval, p. 135.

carried with it a superiority of say 25% in guns or area of armor; would he still say this? And, as Commander Fisk has shown, a slight advantage of strength at the commencement of a fight increases in geometric ratio as the fight progresses. Even the authority quoted above admits that when the battle is once joined, speed takes a minor place to offensive power.

It is also urged that speed enables a fleet quickly to change from one formation to another, but this should be done before the first shot is fired. Afterward, the fleet which maneuvers least, following well known tactical rules, has the advantage. The only maneuver, except small changes of course, is likely to be a simultaneous change through 8 or 16 points, and the slower ship, being shorter, will probably be the handier.

Admiral Custace, R. N., says: "Whether speed gives any tactical advantage beyond the power to accept or refuse action is still a very doubtful question, and will remain so until the question is properly investigated and tested by experiments." The value of guns and armor is beyond question, but that of speed is problematical: then why sacrifice known and reliable weapons for uncertain and at best unreliable means of employing these weapons?

There are also positive disadvantages to high speed. Either the coal capacity of the ship must be increased, out of all proportion to the gain in speed, or else the radius of action must be correspondingly reduced. The disadvantage of the first is that on a given displacement the guns and armor must be reduced, and the disadvantage of the alternative is self-evident. Also, if it be such a problem to coal our fleet in time of peace, what would it be with greatly increased consumption and in war? The increased cost of maintenance might better be spent in other ways. When the armored cruiser squadron was out in the East, it was the customary thing to see at least one of the ships coaling; so much so that they became known as "Colliers' Weekly." It was also a well known fact that, even with the coal bought at other ports, they were burning it faster than it was being sent out—and there were but four ships of moderate displacement—and in time of peace.

More speed also means greater length; hence larger target and more "soft spots."

If we take the *Dreadnought* as the example par excellence of the fast battleship, and analyze the reasons for her great speed,

fallacies are found. Take, for example, her great head-on fire of 12-inch guns coupled with her great speed. Both could never be necessary at the same time, for: either the range is constant or it is varying. If constant, then both ships must be stationary, in which case speed is not used, or both must be moving in the same direction. To use bow fire then the *Dreadnought* must be *chasing* the enemy, which assumes that she (the enemy) is already beaten. If the range is varying, then to use her bow fire and speed at once, she must pass from the range where her great guns are effective to the range where the enemy's intermediate guns are effective in too short a time for any decisive action.

We hear on all sides about the great value of the large ship of great speed and the greatest practicable armament and protection. This is absolutely correct, providing the proper values are given to the words "great speed" and greatest "practicable" armament. First consider the armor. Two striking lessons from the late war in this regard are: first, that the heavy armor now in use is sufficient to keep out large shells at battle ranges (vide the account of the *Cesarevitch*), and second, that ships as then constructed could be sunk or captured without piercing this heavy armor. The thickness used is not likely to increase, as any increase in the power of the gun will be met by an increase in range, but the area protected must be greatly extended, so as to include all the personnel, the base of the stacks, and the stability and trim both against gun-fire and torpedoes. In the last case, the belt should be raised at the bow, for with a vessel under way, the bow wave comes many feet above the L. W. L., and it is at the bow that speed is most affected by the admission of water. There should be no ports in the heavy side armor. It is worthy of note that the Russians are building in more armor in their new ships than ever before: they should know above all others the effect of gun-fire.

In regard to guns, there are a limited number of places where these can be used to the maximum advantage, and where ammunition can be stowed and supplied. I don't say that the number of guns should be limited to ten, or twelve, or sixteen, but there *is* a limit, and these guns should be of the largest practicable caliber, supplied with shrapnel and common shell filled with some high explosive. There should be no intermediate battery. I realize that the suggestion in regard to the use of shrapnel for great guns,

say 12-inch, is radical, not to say revolutionary, and not supported by any experiments, but the advantages to its use would be enormous. With a mixed battery of 12-inch and 5-inch or 6-inch guns, if the turret's crews were assigned gun stations at the intermediate guns, all the guns could not be manned at once in case of very close action, or in case of a torpedo-boat attack while engaged with an armored enemy. If distinct crews were provided for the intermediate battery, they would either have to stay below the armored deck while engaged at long range, where they would be of little service, or else would have to be exposed to useless slaughter if kept at their guns. By the use of shrapnel, 100 per cent of the battery could be used against an armored enemy, or 100 per cent against an unarmored or semi-armored enemy, or the proportion could be varied to suit any condition or in any direction by simply changing the kind of ammunition used, and every man would be behind heavy armor at all times. As it requires nearly as many men to man a 6-inch gun as it does for a 12-inch one, the economy in the complement would be about 100 per cent for the deck force, and by isolating the crews, each could fight to the finish without reference to the others. The 12-inch shrapnel would do the work of the intermediate battery better than this battery could do it itself. All gunnery officers who have been through battle practice must realize that the whole secret of making hits with intermediate guns is to bunch the shot, no matter where, and extensive calibration practices are carried out for this purpose. Now a 12-inch shrapnel is bound to be bunched, and as there is but one caliber to spot for, the fire control is simple. This shrapnel would be ideal for attacking the "soft ends," masts, fire control stations, stacks, wireless, signals, etc., and would supply the "volume of fire" so often asked for and so difficult to control. The increased facility of control would be especially felt at long ranges, where the attack on fire control, etc., would be of most importance. To attack the semi-armored parts or lightly armored vessels, common shell filled with high explosive should be used. The damage, being concentrated, would be more serious than many smaller wounds, and the moral effect of the explosions would be great. In regard to torpedo-boats, the use of a 4000-yard torpedo and the probability of this being soon surpassed, makes it imperative to stop the torpedo-boat at a great range. Owing to her small size, the rapid change of range, and the trajectory of

the 6-inch gun, this would be very difficult, and several hits, while insuring her destruction, might not stop her. The 12-inch gun, being more accurate at long range than the 6-inch, would be more likely to hit, especially when using shrapnel, and one hit would ensure annihilation. These advantages of the use of shrapnel for 12-inch guns are so great as to seem to justify some experiments, and if the need thereof can be clearly shown, I am sure the mechanical difficulties can soon be overcome.

I would not only drop all guns below 12-inch for battleships, but I would not stop at that caliber. As stated above, the places on shipboard where great guns can be used to the maximum advantage are limited, and when this limit is reached, any economical increase in strength must come, not in the number, but in the power of the guns themselves. To increase this power either the velocity or the caliber must be increased. The first can be attained only by higher pressures and greater length. As the present service pressure gives a temperature of 2000° F., the welding point of steel, on firing and as erosion now is excessive, the maximum velocities are not likely to be much higher. The only increase then lies in larger caliber, which has this advantage, that the heavier the shell, the flatter the trajectory at extreme ranges, and lower pressures mean longer life for the gun.

The value of the "great speed" now remains to be determined. While guns and armor have been racing for supremacy, the highest speeds have remained nearly constant. The reason for this is that the horsepower increases as the cube or even as the fourth power of the speed after a certain point is reached, and soon becomes prohibitive. The improvements in engineering have not changed this point to any great extent, and there is no immediate prospect that it will be changed. The calculations of a French officer,[6] and one who is an advocate of high speed, show that to give an 18-knot battleship of 18,000 tons a speed of 21 knots, one-sixth of the battery or one-fifth of the armor must be sacrificed. This is a very large sacrifice, equivalent to five ships against six in offensive power, but for an increase of another three knots nearly twice as much of the remaining battery or armor would have to go. There may easily be a division of opinion as to the advisability of an increase from 18 to 21 knots, but I think that very few will think it advisable to sacrifice between

[6] Captain Vignot, in the Moniteur de la Flotte, Sept. 30, 1905.

30 per cent and 40 per cent of power for an increase from 21 to 24 knots speed, and practically none will say that any decrease in speed below 18 knots would be compensated for (except in such cases as the *Idaho*, where the displacement was limited by law to an abnormal figure). Therefore the proper speed must be somewhere between 18 and 21 knots, and 19 knots may be taken as a good mean, above which the gain in speed would not justify the sacrifice in power, and below which the gain in power would be too small to justify a reduction in speed. The engines should be designed for a very high cruising speed, such as those in merchant vessels, for the real value of speed lies not in the ability to make spurts, but in the wide field of strategy. Give the ships coal capacity enough to enable them to run from one base to another, with a good allowance for emergencies,[1] and do this on the least displacement. In case improvements in machinery, such as turbines or internal combustion engines, result in a saving of weight for a given horse-power, this weight may be better utilized in better protection than in speed.

I have not always held these views in regard to speed and I have not distorted facts in an attempt to support them; on the contrary, I was a firm believer in high speed. But in searching through a large amount of literature on the subject, I could find no logical support for this position. Everything pointed irresistibly to the fallacy of sacrificing beyond a certain point, known and reliable weapons for something which at best is but a tactical element of questionable value and great cost. Vitesse c'est Faiblesse.

[1] In the late war, many of the fast vessels were compelled to slow down owing to shortage of coal. No corresponding gain compensated for this loss.

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ANOTHER ARGUMENT FOR SPEED IN BATTLESHIP DESIGN.

By LIEUT.-COMMANDER YATES STIRLING, JR., U. S. Navy.

There is hardly a subject upon which more has been written, in the field of naval policy, than speed in battleship design, yet to the writer's knowledge the logical argument *for* speed has never been advanced, or if advanced he has not recognized it.

As far as he can learn opinion is divided (about equally) between the advocates of high speed on the one hand and on the other those who would put this additional weight in guns and armor.

The advocates of the latter policy give as their defence that the slower and consequently stronger fleet can by always maintaining the faster leader abeam of its leading ship render negative this speed superiority, and, at the same time by the mere fact of its heavier fire and greater protection against the enemy's fire, keep the faster fleet from entering torpedo water. This has been many times demonstrated on the game board as now played.

It is an axiom of gun fire that a shell will not hit, no matter if the gun pointer is the most skilled individual in the world, if the sight bar on the instant of firing is not reasonably accurate; in fact, at a range of 6000 yards, the sight bar at the instant of firing should read the range about eight seconds after the shell has started on its flight. However, we can not in the navy worry over such trifles; that is left to our more accurate brothers in the coast artillery to struggle with. Another point quite as important as the range is the change of range. Knowing the range at a given instant will be of small value if the change and the sign of the change is unknown.

In order to demonstrate more clearly, two fleets have been maneuvered to scale in the drawing on page 248.

At position 1, the two squadrons are taken to be at a distance of exactly 6000 yards, measured from the plotted positions of the two hostile squadrons.

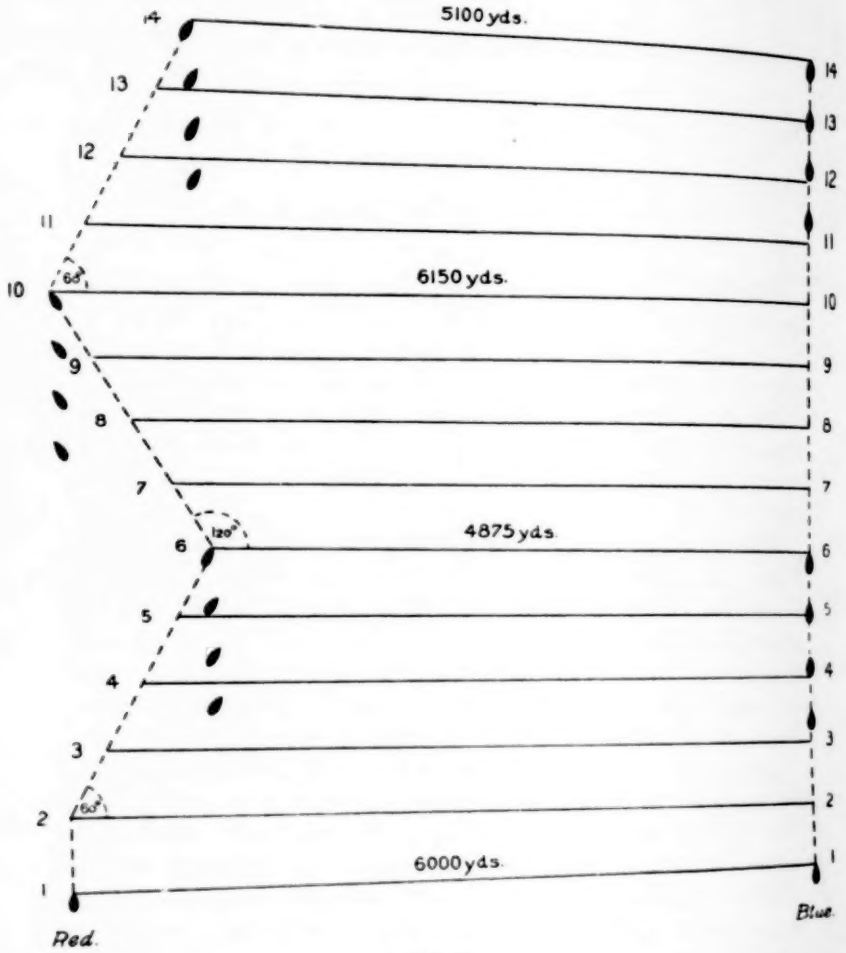


FIG. 1.

The red squadron has three knots superiority of speed, or 18 against 15 knots. The slower blue squadron, by the terms of the problem must keep the red leader abeam to counteract the advantage of speed. At the first position the squadrons are exactly abeam of each other and the time between positions is one minute.

At position 2 red changes simultaneously toward the enemy, bringing the enemy's leader to bear from its own leader 60° from the bow, which is within its speed angle and fire arc.

The total change of range is made up of two changes: 1st. The change of red from a stationary point (the blue vessel at the instant of observation); 2d. The change of blue from such a point. Combining these two we get more or less accurately the number of yards which the red and blue vessels increase or diminish the distance between them during a small increment of time; say one minute. Curves have been plotted by the writer for speeds of 18, 16, 15 and 12 knots.

By reference to Fig. 2, as blue constantly keeps the red leader abeam of its leader, the change of range will consist in this case of only one of the two changes; that due to blue's bearing and red's speed.

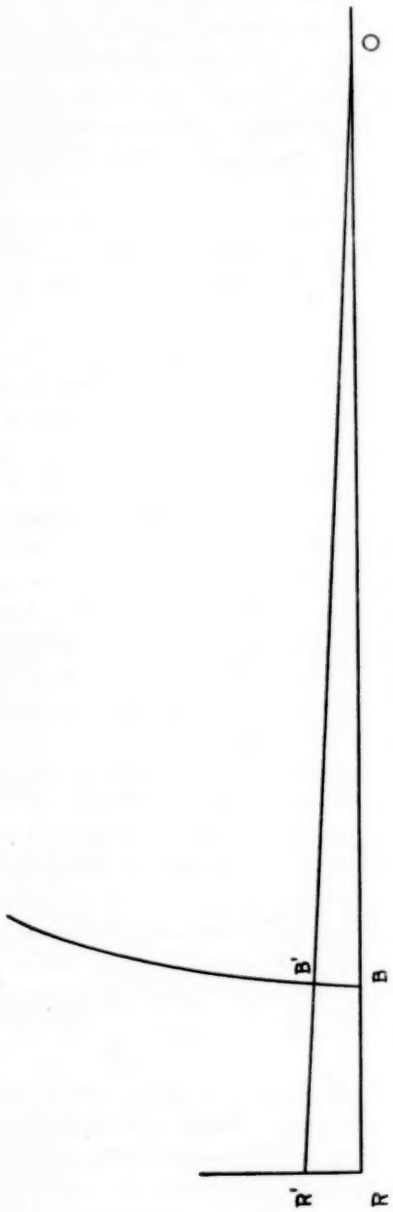
Then from position 2 (Fig. 1), the fire control on red will find from the 18-knot curve for the angle of 60° the change of range 235 yards a minute, decreasing. This is used on the instrument and at position 6 the range sent to the guns will be 4940 yards. The actual distance by measurement is 4875 yards. At position 6, red is shown to change simultaneously away from blue, bringing blue to bear 120° from the bow. Now the change of range from the curve is 320 yards, thus the sight bar range of red at position 10 is 6220 yards. The measured distance is 6150 yards. At this position red again changes towards blue, making the bearing 60° and uses a change of range of 265 yards a minute. The sight bar range at 14 will be 5160 and the measured distance 5100 yards.

No allowance in the above maneuver has been made for the advance and transfer in turning, and the times used are two small for practice, but do well enough for a demonstration.

If red finds the bearing of blue is changing it will know that the red is drawing ahead because it is not using all of its speed angle, and can change its rate of range according to the changing angle.

With the slower fleet the change of range can be but a matter of guess, helped in a measure by good spotting—the shorts only can be spotted and the best spotter known has an average error of over two hundred yards at 6000 yards.

The slower fleet's only chance for success is to be able to quickly and accurately observe the movements of its enemy and in



OB : OR :: 15 : 18

R'O — RO = Change of Range from point O.
But OB = OB' " " " " " is R'B' — RB,
or the Change of Range between the two squadrons.

FIG. 2.

estimating the course may use a more or less accurate change of range. Estimating the course of the enemy can be done by observing the apparent spacing of its enemy's smoke pipes or its masts, but the experience of officers so far has given us but little accurate data on the results of this method. A genius may now and then appear who can tell, through an unexplained "gift of the gods," the enemy's heading within even a point, but that error will lose many well aimed shots. Then the enemy's speed is an uncertain factor to those who are simply depending upon snap judgment, or as Commander Niblack aptly puts it, "the vernier eye."

On the other hand the faster fleet is holding the range with ease and is hammering its shells home as if it were engaged in target practice at an anchored target.

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A PLEA, AND A PROPOSED PLAN, FOR THE SIMPLIFICATION OF SUMMARY COURTS-MARTIAL.

By LIEUTENANT A. G. HOWE, U. S. Navy.

The present formality and verbiage connected with summary courts-martial seem to provoke universal dissatisfaction, but as far as the general service is concerned, no relief from this condition of affairs is in sight. The proposed plan doubtless contains faulty features, and parts of it may be found to contravene legal features of which I am not cognizant, but it is put forth in the hope that it may act as a groundwork for the building up of a simple form of summary courts-martial which would essentially satisfy the ends of justice, and would remove the present objection to ordering summary courts-martial because of the very considerable amount of labor entailed by them.

The point of view of revising authority is of course totally unknown to me, but it would appear that the minute attention necessary to avoid passing over a small technical error, of no importance whatever as far as the securing of justice is concerned, must be a source of considerable annoyance to officers of high rank with manifold important duties to perform. I can speak with some slight experience of the point of view of recorder and convening authority. Probably most of those officers who have had much experience as recorder of a summary court are able to remember the sensation of fear and trembling with which they approached the trial of their first case, and the sense of exasperation and impotent wrath with which they tried to get the proceedings correctly written up. Also the amount of time that they were forced to spend copying legal phraseology from one piece of paper to another.

Of course the first sensation of the recorder soon wears off, and, in time, he becomes so calloused to the second that the tearing up

and re-writing of a page or, perhaps two pages, of a record, is assumed in the calm spirit of bowing to an acknowledged necessity.

The convening authority, unless he is fortunately, or perhaps unfortunately, so familiar with the forms of procedure as to know the exact phraseology demanded, and every minute detail of the proceedings, must frequently stop and refer to the established "Forms of Procedure" to see that his efforts toward the correct and necessary discipline of the ship are not upset by some trifling omission of a few words, and must be constantly on the alert, during the course of his entire perusal of the proceedings, for the smallest trifles that might tend to defeat the end for which the trial was held.

The great loss of time in summary courts-martial has always been a very noticeable matter to me, but under the conditions with which they are held on torpedo-boat destroyers and torpedo-boats it has become especially pronounced. To hold a summary court-martial on a torpedo-boat or a destroyer generally necessitates first notifying three officers, from three different boats, that a court will meet at a certain hour. Then the officers must frequently set aside necessary ship's work to gather at the appointed rendezvous, hold the court, and then return to the various boats from which they have come, and again take up the thread of their interrupted work. After the recorder has completed the proceedings he must then mail, or himself carry, the record to the different boats, and any errors to be corrected multiply the delay and the time lost in bringing the offender to punishment, or in acquitting him.

The greatest complaint regarding summary courts-martial is not in the time actually occupied in the trial, but in the time required, by the established forms, necessary to complete the proceedings. One paragraph in the established forms of procedure is the cause of more trouble and paper work than any other one paragraph, viz.: "The accused is not called on to plead, but is considered as having pleaded 'not guilty,' and if he voluntarily pleads 'guilty,' the court will proceed as if he had pleaded 'not guilty.' In case a plea in bar of trial is offered, the court should hear it fully and consider it when coming to a finding, as it is the duty of the court to try the case." The reason why a plea of guilty is not allowed before a summary court, when it is part of the proceedings of a general court-martial, is not patent, and it appears most illogi-

cal for the court to try a case when it has decided that a plea in bar of trial is legitimate. In such case it would appear illegal to assign a punishment, and what end of justice is furthered by proceeding with the trial.

The present prescribed "Forms of Procedure" make for exactness and attention to detail, and frequently teach the recorder to use more than two fingers when writing on a typewriter, but do these features in any way compensate for the loss of time involved, and would not a simpler form equally satisfy the ends of justice?

In the present proposed skeleton form, the parts to be supplied on printed sheets are those printed in capital letters.

PROPOSED FORM.

CONVENING AUTHORITY.

FULL NAME	RANK	BRANCH OF SERVICE	SHIP OR STATION	DUTY PERFORMING

MEMBERS.

NAME	RANK	BRANCH OF SERVICE

RECORDER.

NAME	RANK	BRANCH OF SERVICE

THE COURT MET { AT ..... (time)..... (date) .....
ON BOARD .....

(Scratch out the one not used.)

PURSUANT TO ORDER.

PRESENT ALL THE MEMBERS AND THE RECORDER.

THE COURT WAS THEN CLOSED, THE RECORDER WITHDRAWING, THE COURT EXAMINED THE SPECIFICATION AND FOUND IT TO BE CORRECT,

or

THE RECORDER WAS DIRECTED TO CORRECT THE FOLLOWING CLERICAL ERROR IN THE SPECIFICATION.

(Scratch out the one not used.)

Allow a small space here to admit of entry in case the court should reject the specification.

THE ACCUSED ENTERED AND, IN RESPONSE TO QUESTIONS BY THE RECORDER, STATED:

A. THAT HE DID NOT DESIRE COUNSEL,

or

THAT HE DESIRED TO HAVE ..... ACT AS HIS COUNSEL, AND ..... ACCORDINGLY ENTERED TO ACT AS THE COUNSEL FOR THE ACCUSED.

(Scratch out the one not used:)

B. THAT HE HAD RECEIVED A TRUE COPY OF THE SPECIFICATION PREFERRED AGAINST HIM AT .....

C. THAT HE WAS READY FOR TRIAL.

THAT HE WAS NOT READY FOR TRIAL.

(Scratch out form not used.)

Allow space here to be used in case the accused is not ready for trial.

THE RECORDER THEN READ ALOUD THE ORDER CONVENING THE COURT (AND) THE ORDER APPOINTING ..... A MEMBER VICE ..... RELIEVED ..... THE ORIGINALS OF WHICH ARE (IS) PREFIXED TO THE RECORDS IN THE CASES OF .....

(Scratch out words and letters not used.)

THE ACCUSED STATED, IN RESPONSE TO AN INQUIRY OF THE RECORDER, THAT HE DID NOT OBJECT TO BEING TRIED BY ANY MEMBER PRESENT. THAT HE OBJECTED TO BEING TRIED BY ..... FOR THE FOLLOWING REASONS:

(Scratch out form not used.)

Allow a space here for the insertion of the reasons.

THE COURT WAS CLOSED TO CONSIDER THE OBJECTION AND, AFTER DUE DELIBERATION, WAS OPENED AND THE SENIOR MEMBER STATED THAT THE OBJECTION WAS SUSTAINED.

WAS NOT SUSTAINED.

If the objection should be sustained, a blank page with the consequent action of the court until next trial reaches the present stage, would have to be filled in and inserted here.

THE MEMBERS WERE THEN SWORN BY THE RECORDER AND THE RECORDER WAS SWORN BY THE SENIOR MEMBER, ALL OATHS ADMINISTERED ACCORDING TO LAW AND IN THE PRESENCE OF THE ACCUSED.

THE SPECIFICATION WAS THEN READ ALOUD TO THE ACCUSED, BY THE RECORDER, THERE BEING NO WITNESSES PRESENT.

ALL WITNESSES HAVING WITHDRAWN.

(Erase, scratch out, form not used.)

ORIGINAL OF SPECIFICATION ATTACHED TO PRESENT RECORD MARKED "——"

THE RECORDER THEN ASKED THE ACCUSED WHETHER HE WAS GUILTY, NOT GUILTY, OR GUILTY IN A LESS DEGREE THAN CHARGED, OF THE OFFENSE SPECIFIED, TO WHICH ACCUSED PLEADED:

If the accused pleads guilty let the page be completed as follows: (Furnish an especially large number of forms of this description.)

The senior member then informed the recorder that he should introduce evidence of previous trials and convictions if such exist.

THERE WAS NO EVIDENCE OF PREVIOUS TRIALS AND CONVICTIONS.

THE RECORDER THEN SUBMITTED THE FOLLOWING EVIDENCE OF PREVIOUS TRIALS AND CONVICTIONS:

(Scratch out form not used.)

PREVIOUS CONVICTIONS.

READ FROM	OFFENSE		FINAL SENTENCE	DATES OF APPROVAL		
	WHEN	WHERE		CONVENING AUTHORITY	REVISING AUTHORITY	JUDGE ADVOCATE GENERAL

If the accused pleads not guilty or guilty in a less degree than charged, let the remainder of the proceedings be filled in on the following forms.

EXAMINATION OF WITNESSES.

CALLED BY	NAME	RANK OR RATE	BY	BRIEF OF QUESTIONS	BRIEF OF TESTIMONY

ALL WITNESSES WERE DULY SWORN ACCORDING TO LAW BY THE SENIOR MEMBER, IN THE PRESENCE OF THE ACCUSED.

BRIEFS OF THE TESTIMONY AS HEREIN ENTERED WERE READ ALOUD TO THE WITNESSES, BY THE RECORDER, AND WERE BY THEM PRONOUNCED TO BE CORRECT.

No alternative form for correction of testimony is entered here. In the brief of questions it could appear that the recorder asked the witness whether his testimony were correct, and if not the amendment would show in the brief of testimony.

BEFORE LEAVING THE COURT ALL WITNESSES WERE CAUTIONED, BY THE SENIOR MEMBER, NOT TO CONVERSE UPON MATTERS PERTAINING TO THE TRIAL.

AFTER THE EXAMINATION OF ALL THE WITNESSES THE COURT WAS CLOSED FOR DELIBERATION. THE RECORDER WAS THEN CALLED BEFORE THE COURT AND INSTRUCTED TO RECORD THE FINDING AS FOLLOWS:

In case the specification was proved, or proved in part.

THE SENIOR MEMBER THEN INFORMED THE RECORDER THAT HE SHOULD INTRODUCE EVIDENCE OF PREVIOUS TRIALS AND CONVICTIONS.

THERE WAS NO EVIDENCE OF PREVIOUS TRIALS AND CONVICTIONS.

THE RECORDER THEN SUBMITTED THE FOLLOWING EVIDENCE OF PREVIOUS TRIALS AND CONVICTIONS:

(Scratch out form not used.)

IN THE PRESENCE OF THE ACCUSED.

(Form here to be inserted the same as already given.)

THE COURT WAS AGAIN CLEARED FOR DELIBERATION AND THE RECORDER WAS THEN CALLED BEFORE THE COURT AND INSTRUCTED TO RECORD THE SENTENCE AS FOLLOWS:

THE COURT DOES THEREFORE SENTENCE HIM, THE SAID ..... TO THE FOLLOWING PUNISHMENT:

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FLEET STEAMING AND ECONOMY.

By LIEUTENANT H. C. DINGER, U. S. Navy.

During fleet steaming one of the chief objects of the engineer department should be to do the steaming with the very least possible consumption of fuel. It is not necessary to dilate on the great importance of economy in coal consumption. It is so important that we can not afford to neglect any help to economy no matter how slight or distant it may be. Aside from the question of methods of economical operation, that can be controlled and modified by the engineering personnel on board ship, there are numerous matters which affect economy and over which the engineering personnel has little or no control. It is concerning some of these matters that I wish to say a few words which may help to disburse some bits of information on this subject to many who may be more or less in control of some of these matters.

Uniformity of Speed in Fleet Steaming.—Suppose the speed of a fleet of ships has been decided upon. Then the greatest economy at that speed will be obtained when the speed of the fleet is kept absolutely uniform. It is thus of exceptional importance that the leading ship keep a constantly uniform speed. If the leading ship does not keep this uniform speed, all the others will be thrown out and can not keep their speed uniform. As the variations of speed are transmitted down the line they will become greater and greater, so that the last ship in line will have to vary her speed to very great amounts in order to keep in position. This may often be so bad that the 12th or 16th ship in line may sometimes have to vary from full speed to stop and vice versa. The lack of uniform speed will mean an increase in coal consumption for all of the ships down the line, and the greater the variations, and the more frequently they occur, the greater will be the waste.

The question may be asked why do slight variations make any

considerable difference. Let us see. In order to propel a ship at a given speed it will require a certain uniform quantity of steam. After steaming uniformly for some time the engineer department can become adjusted to this demand, and if it is not changed, can get everything to work economically at that speed. For instance, the cut-offs, throttle, receiver pressure and steam pressure can be adjusted so as to get the most economical result. The draft, the rate at which the coal is to be burnt and the method of firing can be closely adjusted and special attention can be given to any little hitches here and there. Suppose a uniform speed is secured, and the department has adjusted itself to produce the power required. A change of speed is signalled. What does this mean? It means not only a change in the throttle. It may mean a shifting of the cut-offs, a change of speed in the blower engines or going from natural to forced draft. At once it means a different rate of burning coal, the opening or closing of dampers and the shifting of ash pan doors, a change in the speed in your feed, air and circulating pumps, it may mean the opening of the bleeders and the starting or shutting down of evaporators. Now all these things can not be done in a moment and if the changes are frequent and of any magnitude they can not be done each time a change of speed is signalled. But in order to comply with the changes signalled what is done? The boilers and engines are operated so that a great excess of power can be obtained quickly. To be able to give this excess power it is necessary to operate the machinery under very uneconomical conditions which require the consumption of a much larger amount of coal. It means that blowers will be going when they are not at the time needed. It means that the cut-offs will be set for high power, which setting will be wasteful for the operating speed. It means that the bleeder will frequently be open for large portions of the time. It means that the firing will at times be erratic and hence uneconomical. All these sources of waste will be present in order that the increase in speed may be had at once and without warning.

If the necessity for frequent sudden changes of speed is done away with, the engineer department can adjust itself to an economical basis.

When steaming at a prescribed speed, the principal matter affecting changes in speed is probably the uniformity of the speed of the leading ship, another matter is the distance between ships,

and a third is the ability of the officer of the deck of each ship to keep his ship in position without giving, suddenly, material changes in speed. If the distance between ships is greater the need of being exactly in position is not so great and any loss of position can be made up gradually when proper warning for changes can be given to the engine room. Hence if economy is desired the distance between ships should be ample.

The last cause enumerated above depends upon the skill of the officer of the deck. A great deal of lack of skill here is due to a natural though wrong conception of the time it requires a large heavy vessel to feel the effect of a change in revolutions. The proportional change in the speed of the ship does not take effect the moment the revolutions are altered. In fact it takes a very appreciable time and the heavier the ship, the longer it will take. Neither can any material loss of position be made up quickly except by very great changes in power and after a great change in power there is the inertia to deal with in again getting down, or up, to the uniform speed. Just what a ship will do can of course only be found by actual trial and practice, but a thoughtful consideration of what it means to overcome the inertia of 16,000 tons will help in getting a practical idea of the need of gentleness and careful judgment in adjusting to a certain constant speed.

Need of Warning.—One of the great difficulties in being able to comply with a signal for a great variation in speed, is that often the signal for change comes without any warning whatever. Suppose a vessel is steaming at 12 knots, when full speed is ordered. Full speed will mean a speed of 15 knots. Now the power for 12 knots is, let us say, 4000 I. H. P., for 15 knots the power will be about 8000 I. H. P.; that is double the power. Now if some minutes warning is given, preparations for doubling the power can be made, but when such warning is not given, it is no small matter to double the amount of steam that your boilers are evaporating at the sound of a gong. Suppose now that the vessel has steamed 20 minutes at 15 knots, when without any warning the speed is changed to 12 knots, or perhaps 10 knots. What condition is presented? This is it: you have 4000 or 5000 I. H. P. that must be disposed of immediately. In high powered vessels with water tube boilers there is little extra storage space to put this extra power which must be gotten rid of. The recourse is to open the bleeders wide and if this does not answer, the safety valves will

lift. In both cases the extra power is a direct loss. If a few minutes warning were given to the engine room of the probable change, this loss could be almost all avoided by modifying the firing.

Every particle of a minute's warning to the engine room of changes in speed is of direct value not only in saving coal, but it avoids sudden strains on the machinery and boilers and also strains on the temper of every man in the engineer department. Suppose you are a fireman and are firing for dear life, and just as you get your fire in good shape the order comes for closing dampers and putting on ash pan doors; then just as you have done this, and before you have had time to turn around, you are told to make all the steam you can; and this performance is repeated at frequent intervals. Under such conditions how long would you feel like firing properly?

It is these sudden and unexpected alterations in speed that are the bane of the engineer department when steaming in the fleet. Most of the changes are of course necessary to perform the various evolutions, but I fear that often there is no vivid realization of the hardships, that are transmitted by them, to the boiler and engine room. It is also probable that in many cases, more or less warning could be given and also occasionally these very violent alterations in speed could be avoided. The first aim of the engineer department is, of course, to obey the signal at once and bring about the change asked for, but in being able to do this, often all regard for economical operation has to be laid aside.

Some Other Matters Conducive to Saving or Waste.—Much coal can be saved by knowing definitely, and well beforehand, the time for getting under way and of coming to an anchor. If the time of anchoring is known the fires can be regulated so that little extra fuel is on the grates. If warning is not given a great deal of fuel may be wasted. Nothing is more conducive to saving coal than to know as soon as anchored whether the fires can die out or whether they have to be banked or for how long either condition is likely to exist. If possible this information should be available before anchoring. Another saving is a reduction of speed, known beforehand, about half an hour before anchoring. Considerable saving is also possible, especially in a fleet, by starting out at a reduced speed and giving some time to work up to the standard speed to be used.

Economical Speed.—The idea that the economical speed of a high-powered vessel is considerably higher than that of a low powered vessel is sometimes entertained. This is an error. There is some slight effect due to the fact that engines of the high powered ship are working at a lesser percentage of their full power and hence are working at a somewhat less economical rate. The economical speed of no ship having efficient machinery should be over 10 knots. For most large vessels it would be considerably less than this. If it is found that under actual conditions the economical speed is greater; it shows that there are very defective conditions of operating at the low speeds or that the auxiliary services require an excessive amount of steam.

The conditions for obtaining the greatest economy in steaming are: (1) Steam with natural draft. (2) Use sufficient boilers so that the necessary power is obtained while burning not more than 15 and not less than 10 pounds of coal per square foot of grate. (3) When steaming alone fire as uniformily as possible and use the steam as it is made rather than attempt to keep a constant number of revolutions. It is usually best for economy to have a regular coal allowance and make as much as possible with this. (4) Adjust the engines to work most economically for the speed; each speed requires certain adjustments which will be the best for that condition. (5) Use as few auxiliaries as possible and see that all in operation are operated in the most economical way.

Other Outside Effects.—A vessel by itself can be more economical than when in a fleet of vessels, and the larger the fleet the greater will be the effect of this waste. Also a fleet steaming in several columns will steam more economically than one in one long column, since the interference is less.

Vessels usually give a better speed for the same power, when they are well down by the stern, and on the other hand being down by the head detracts from the speed. It is thus advisable to get the ship down by the stern with the use of water ballast if necessary. This effect will be considerably greater when there is somewhat of a head sea.

A very great factor in economical steaming is the management of the helm. If the ship can be steered with little or no movement of the helm, all the power the propellers exert will be utilized to drive the ship on her course. If the helm is frequently moved

a considerable percentage of the power is used in churning the water and turning the ship from side to side. This loss is aside from the loss in speed caused by the difference between the straight and the wavy course over which the vessel moves.

A vessel will steam with more economy when there is a good draft than when there is a poor one. A good draft gives a better furnace efficiency and also enables the fireman to work his fires in a more efficient manner. Just here comes in the importance of keeping ventilators constantly trimmed to the wind so as to always get all possible benefit from whatever breeze that may be blowing.

It may be learned from this that like results are not always to be expected when some of these outside conditions have changed. And it will also be seen that there are quite a number of things, extraneous to the engineer department, which affect the steaming economy of the ship, and to obtain the best results in this, as well as other matters, requires the co-operation of many persons who perhaps do not always realize that they are exerting any influence in the matter.

Most of the points cited have perhaps a very small effect alone, but when several of them are added together it can well be said that they are worth looking into.

Time Allowed for Repairs.—Another matter that indirectly affects economy and directly affects the efficiency of the machinery, is the matter of being allowed permission to overhaul machinery at every possible occasion and in considering that an extensive period for overhauling is worth a very great deal more than the same aggregate time, when given by installments. There is never a time when some part or appurtenance can not be improved by being overhauled, cleaned or repaired, and permission should always be allowed to disable machinery for repairs whenever this is under any circumstance possible. It is only by being constantly overhauled, and by taking advantage of every possible chance to overhaul, that the machinery can be kept in proper readiness for a call. If the opportunity for overhauling is put off from time to time there is just that much greater chance of a break down, or of the machinery failing to do what is expected of it.

Attention to the Operation of Special Service Auxiliaries.—A very considerable loss of heat and consequent fuel, and one which not only the officer of the deck but also various petty officers can

assist in remedying lies in the comparatively long time that the various special auxiliary machinery is left inactive with steam up to the throttle or where such machines are kept in operation beyond the times that their services are in use. Instances may be recalled by many where deck winches, steam cranes, isolated pumps, anchor engine, etc., are left inactive for various lengths of time with steam up to the throttle. The fire pumps, hydraulic pumps, etc., are sometimes kept going for large portions of the day while the water or the power is not being used. These auxiliaries when in operation and not needed as well as when inactive and having steam up to throttle are utilizing heat and consequently wasting fuel.

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THE NAVY'S PART IN THE ACQUISITION OF CALIFORNIA, 1846-1848.

By ROBERT WILDEN NEESER.

Although the war between the United States and Mexico actually began on April 24, 1846, the relations between the two countries for the past two years had been daily becoming more and more strained.[1] As early as October, 1842, Commodore John D. Sloat, who commanded the American squadron in the Pacific ocean, had received intelligence which induced him to believe that Mexico had declared war against the United States;[2] he accordingly took possession of the town and bay of Monterey, but two days later withdrew his forces upon learning that the relations between the two nations were still peaceful. On the 24th of June, 1845, he received confidential instructions from the Secretary of the Navy, George Bancroft, calling his "attention to the present aspect of the relations between this country and Mexico," notifying him that it was the earnest desire of the President to pursue a policy of peace, and directing him to be "assiduously careful to avoid any act of aggression."[3] But, at the same time, if Mexico should be "resolutely bent on hostilities," he should at once employ the forces under his command to the best advantage; and one of his first acts should be to take possession of the port of San Francisco, and occupy or blockade such other Mexican ports in the Pacific, which were generally open and defenseless, as his forces might warrant. Should he occupy San Francisco and other Mexican ports, he was to take care to preserve, if possible, the most friendly relations with the inhabitants, and, if practicable, induce them to adopt a course of neutrality. In his report to the Presi-

[1] Burgess, 329.
[2] Capron, 37.
[3] Letter of Geo. Bancroft to Com. Sloat, Report Sec. of Navy (1846), 378.

dent, the Secretary of the Navy says that Commodore Sloat "observed the line of conduct prescribed to him with such intelligence and fidelity that no complaint has ever been made of any unauthorized aggression on his part."

On May 13, 1846, Secretary Bancroft wrote again to the commodore, informing him that the events alluded to in his letter of June, 1845, had taken place, and directing him to carry out the instructions then given him with "energy and promptitude."[4] Long before these orders could reach the Pacific coast, Commodore Sloat had acted with all the required energy and promptitude.

On June 7, 1846, while lying at Mazatlan, he had received conclusive information through Mexico,[5] "that the Mexican troops, six or seven thousand strong, had, by order of the Mexican government, invaded the territory of the United States, north of the Rio Grande, and had attacked the forces under General Taylor, and that the squadron of the United States was blockading the ports of Mexico on the Gulf." Properly considering these hostilities as justifying his commencing offensive operations on the west coast,[6] he, on the following day, sailed in the frigate *Savannah* for the coast of California. He reached Monterey on the 2d of July, and there found the *Cyane* and *Levant*, which had been previously ordered forward, awaiting the outbreak of hostilities.

Upon his arrival, however, the commodore found that the spirit manifested towards the Americans was so different from what he had expected to find, that he hesitated for several days to raise the American flag over the town. But on July 6, he decided to assume the responsibility of such an act, preferring, as he himself expressed it, to be sacrificed, if he had to be, "for doing too much than too little."

On the following morning, July 7, 1846, he sent Captain Mervine on shore with a summons to the military commandant of Monterey, for its immediate surrender to the United States. Receiving an unfavorable reply, the commodore landed a force of two hundred and fifty sailors and marines, which took possession of the town and hoisted the American flag over the custom house.[7] In his proclamation to the inhabitants, Sloat said that henceforth

[4] Hittell, 458.

[5] Official Report of Com. Sloat to Secretary of Navy, July 31, 1846.

[6] Report of Secretary of Navy, 1846, p. 378.

[7] Report of Com. Sloat to Secretary of Navy, July 31, 1846. Report of of the Secretary of the Navy to the President, 1846, p. 640.

California would be a portion of the United States, and that its peaceful inhabitants would enjoy all the rights and protection granted to American citizens.[8]

Such were the circumstances of the seizure of California by the United States. It was a war measure; but it was a measure contemplated and determined on before the war. It was a seizure with the intention and for the purpose of holding the country permanently as a conquest. There were elements of violence and aggression in the purposes of those who planned. But in some important respects it differed from other conquests of foreign territory which the world has witnessed. It was a conquest, advantageous indeed to the conquerors, but no less so to the conquered. It was a conquest by which the conquered were to be made a part and parcel of, and enjoy the same rights and privileges as, the conquerors. It was a conquest which could hardly have been possible in any other part of the globe or conceived by any other people than those of the United States. With the exception of the impracticable guaranty of the quiet possession of land held under mere color of right, every word of Sloat's proclamation was the voice of the United States speaking through him; and all that it promised, and more than all, was accomplished and effectuated by the result. For these reasons the document, little attention as has hitherto been paid to it, is one of the most interesting and significant state papers in the American archives.[9]

Meanwhile, on July 6, the day before the seizure of Monterey, the commodore had sent orders to Commander Montgomery, commanding the sloop-of-war *Portsmouth*, then stationed in the Bay of San Francisco, announcing to him his determination, and ordering him to hoist the flag of the United States at Yerba Buena (San Francisco) and to take possession of the surrounding country.[10] Sloat's message reached Montgomery on July 8. The following morning a force was landed and the American flag hoisted in front of the custom house in the public square, amid the cheers of the assembled people.[11] When the ceremonies of taking possession were over, the seamen, with a small portion of the marines, returned to the ship, leaving Lieutenant Watson, with a small guard, as military occupants of the post. Soon after the withdrawal of the sailors, the male residents of Yerba Buena, capable of bearing arms, were called together, and enrolled into a volunteer company of thirty-two, which was to assist the United States forces in case of an attack by the enemy. In the afternoon of the

[8] Proclamation of Com. Sloat to the inhabitants of California, July 7, 1846.

[9] Hittell, 466.

[10] Letter of Com. Sloat to Com. J. B. Montgomery, July 6, 1846.

[11] Report of Com. Montgomery to Com. Sloat, July 9, 1846. Report of Secretary of Navy to President, 1846, 640.

same day, a portion of the volunteers, under Lieut. T. S. Mosroon, took possession of the fort at the entrance of the harbor. Notwithstanding the fact that the fort was in a delapidated condition, the American flag was raised on its ramparts; and from that time on the Stars and Stripes have maintained their "sleepless watch" over the Golden Gate.

On the same day that Commander Montgomery took possession of Yerba Buena, a detachment under Lieut. J. W. Revere landed at the town of Sonoma and occupied it;[12] and two days later Montgomery was able to report to his superior that the United States flag was then flying also at Sutter's fort on the Sacramento, and at Bodega on the coast; and that everywhere, on account of the protection it promised to persons and property, it had been hailed with satisfaction.[13]

Immediately after seizing Monterey, Commodore Sloat despatched a courier to General Jose Castro,[14] the military commandant of California, with a copy of his proclamation and a letter, demanding the immediate surrender of all the troops, arms and public property under his control, so as to prevent the sacrifice of human life and the horrors of war which might otherwise become inevitable.[15] At the same time he invited him to a conference at Monterey to arrange the terms of a capitulation, and receive for himself, and his troops, with the people of California, "assurances of perfect safety to themselves and property." To this letter Castro replied two days later, but instead of answering the propositions contained in it, he devoted his entire paper to certain occurrences which had taken place at Sonoma.[16]

While this correspondence was going on, the commodore hit upon the excellent idea of organizing a company of dragoons, in order to keep open the communications between Monterey and San Francisco, and to protect the people of the country from violence.[17] This force consisted of thirty-five men, and was placed under the command of Purser D. Fauntleroy. On the 17th of July, Fauntleroy was ordered to reconnoitre the country between San Jose and San Juan Baptista, and to hoist the American flag at the latter place. Upon his arrival, however, he found the town

[12] Report of Lieut. Revere to Com. Montgomery, July 11, 1846.
[13] Report of Com. Montgomery to Com. Sloat, July 11, 1846.
[14] Report of Com. Sloat to Secretary of Navy, July 31, 1846.
[15] Letter of Com. Sloat to Don Jose Castro, July 7, 1846.
[16] Letter of Don J. Castro to Com. J. Sloat, July 9, 1846.
[17] Report of Com. Sloat to Secretary of Navy, July 31, 1846.

already in possession of Captain Fremont. The two then marched back to Monterey; and from that time on the country was in the quiet and undisputed possession of the United States forces.[18]

However peaceable the condition of these lately acquired possessions may have seemed to the conquerors, yet to the Californians it did not appear in the same light. Many of them, especially that portion of them who were most hostile to the Americans, firmly believed that the British would interfere and side with them against the invaders. But they were soon undeceived. Whatever may have been the designs of the British Admiral, Sir George F. Seymour, he gave no trouble to the Americans. About a week after Sloat's arrival at Monterey, he sailed into the harbor with his flagship, the 80-gun ship *Collingwood*, and was immediately tended the "usual courtesies and facilities of the port" by the American commodore. The friendly intercourse and reciprocal exchange of kindness subsisting between the two, firmly convinced the Californians of the uselessness of their hopes, and they "abandoned all hope of ever seeing the Mexican flag fly in California again."[19]

Previous to this, on July 11, the British 26-gun ship *Juno* had sailed into the Bay of San Francisco,[20] and anchored at San Solita. On her appearance, Commander Montgomery made preparations to defend his post, but the British commander, after staying a few days, sailed without showing any intentions of interference; and a few days subsequently—July 23—Admiral Seymour left Monterey for the Sandwich Islands.[21] Thus, though some apprehensions were still felt of opposition on the part of England, the British naval officers in the Pacific had not shown any disposition to interfere; and there was nothing for the Californians to do but to submit or fight their battle alone.[22]

On July 15, the day before Seymour's arrival, the U. S. frigate *Congress*, Commodore R. F. Stockton, reached Monterey.[23] Stockton reported for duty to Commodore Sloat; but the latter's health was in such a precarious state that he determined to relinquish

[18] Hittel, 572; Ex. Doc., 2, Sess. 30, Cong. HR, No. 1, p. 1008.
[19] Report of Com. Sloat to Secretary of Navy, July 31, 1846.
[20] Report of Com. Montgomery to Com. Sloat, July 11, 1846.
[21] Report of Com. Sloat to Secretary of Navy, July 31, 1846. Hittell, 573.
[22] Ex. Doc., 2, Sess. 30, Cong. HR, No. 1, pp. 1008, 1020, 1028, 1030.
[23] Report of Com. Stockton to Secretary of Navy, July 31, 1846; NAVAL INSTITUTE PROCEEDINGS, 420.

his command to the former, and return to the United States. He accordingly, on July 23, transferred the command of the squadron to Stockton, and on the 29th sailed for the United States.[24]

Commodore Sloat, in transferring the command of the squadron in the Pacific to Stockton, had directed him "to assume command of the forces and operations on shore."[25] Stockton immediately raised a body of 160 volunteers, known as the "Battalion of California Volunteers,"[26] and placed them under the command of Captain Fremont. On the same day—July 23—Fremont was ordered to embark with his troops on board the ship *Cyane*, Com. S. F. DuPont, which was to convey them to San Diego.[26] The purpose of this expedition was to cut off the retreat of General Castro, and thereby prevent his escape across the Colorado river into Sonora. But unfortunately, when Fremont reached San Diego, he was unable to procure any horses to mount his men, and although he had arrived on the 29th of July, it was not until the 8th of August that he was able to move.[27]

In the meanwhile, Stockton had sailed in the *Congress* for San Pedro, U. C. On the way he landed at Santa Barbara, of which he took possession, and leaving a small force for its defense, he proceeded to San Pedro, where he arrived on the 6th of August. A force of 400 men and some artillery was immediately landed, which captured the place.[28] The following day two commissioners, empowered to enter into negotiations for a cessation of hostilities, arrived from General Castro. They demanded, however, as a preliminary to treating, that Stockton should not leave his present position, but this demand the commodore absolutely refused to grant. Preparations were at once begun for the march into the interior, and four days later the commodore left San Pedro for Los Angeles. The Californians had entrenched themselves about three miles from the city on the "table-land known as the Mesa."[29] On the 12th of August, as they were approaching this strong position, the Americans were met by another of Castro's envoys. He was commissioned to deliver a pompous message, informing the commodore "That if he marched

[24] Report of Com. Sloat to Secretary of Navy, July 31, 1846.
[25] Report of Com. Stockton to Secretary of Navy, Feb. 18, 1848.
[26] Naval Institute Proceedings, 420.
[27] Hittell, 583.
[28] Report of Com. Stockton to Secretary of Navy, Feb. 18, 1848.
[29] Life of Com. Stockton, 122; Hittell, 584.

upon the town he would find it the grave of his men." "Then," replied the old sailor, "tell your general to have the bells ready to toll in the morning at eight o'clock, as I shall be there at that time."[20]

He arrived on time, but the Californian general was unwilling to risk a battle, and fled without awaiting the commodore's approach. Ciudad de los Angeles capitulated unconditionally, and, on the 13th of August, Stockton took possession of the capital of California.[21]

The effect of this successful expedition, though achieved without bloodshed, was equivalent to the most triumphant victory. The flight of Castro, the dispersion of his troops, the capture of Los Angeles, the dissolution of the legislature, and, indeed, of the government—by the flight of the general and governor-in-chief[21]—and the general submission of the inhabitants, apparently terminated all hostilities in California.[21]

Commodore Stockton was averse to the continuance of martial law after the submission of the people. But, as many of the civil authorities of the former government were unwilling to act under the new state of affairs, the commodore ordered an election to fill their places. The election was duly held (September 15) and the officers elected at once proceeded to the discharge of their duties. Major Fremont was appointed military commandant of the territory, and a battalion of volunteers raised. Thus in little more than a month after the expedition started from Monterey, the new government, civil and military, was organized and put in operation, with every indication that the people of California would acquiesce in submission to it without further resistance.[21]

Unfortunately this belief was badly founded, for no sooner had Commodore Stockton left Los Angeles, than Pico and Flores, regardless of their paroles not to serve again during the war, secretly collected the remnants of their scattered forces, and resolved upon another attempt to drive out the Americans.[21]

They began their operations by retaking Los Angeles, which had been garrisoned by a force of less than one hundred men under Major Gillespie. Santa Barbara was likewise captured, and San Diego closely besieged. Encouraged by these successes, Pico and Flores issued "a flaming proclamation, calling upon their countrymen to rise in defense of California, and drive out the

[20] Colton's 30 years in California.
[21] Report of Com. Stockton to Secretary of Navy, Feb. 18, 1848.

insolent invaders from their soil. They pretty generally responded to the call, and an army of about a thousand mounted men was soon collected."[31][32]

As soon as Commodore Stockton was informed of these events, he made prompt arrangements for quelling the insurrection. Colonel Fremont was summoned to San Francisco with his force of volunteers; and the commodore himself proceeded in the *Congress* to San Diego.

Upon his arrival there, he found the place still besieged, and the garrison reduced to severe straits. All the male inhabitants had abandoned the town, leaving the women and children dependent upon the Americans. In addition to these unfavorable circumstances, in attempting to enter the harbor, the *Congress* grounded and was in danger of tumbling over; and while a part of the crew was engaged in extricating her from her position, the enemy commenced an attack upon the town. A portion of the crew of the vessel was immediately landed, and, after a severe action, repulsed the enemy.[33]

As soon as the ship could be gotten off, and securely anchored in the harbor, all the marines and sailors, that could be spared, were landed from the frigates *Congress* and *Savannah*, and preparations begun for the march on Ciudad de Los Angeles. On the 29th of December the advance was begun. The forces under Commodore Stockton consisted of about five hundred men. On the way (as usual) they were met by commissioners from Flores, with propositions for a truce, but these the commodore refused.[35] On January 8, 1847, upon reaching the San Gabriel river, about ten miles from Los Angeles, the enemy were discovered posted on the opposite bank of the stream.[35][36] Their forces consisted of about six hundred mounted men and four pieces of artillery, advantageously posted on the bank about fifty feet above the level of the river. The Americans immediately crossed under a galling fire, and posted their guns on the opposite bank, from whence they opened fire upon the enemy. While the attacking party was being formed, some of the Californians charged upon their flank, but were met with so hot a reception that they fell back; and about the same time they withdrew their artillery also further back. The Americans then charged up the hill, but the enemy

[32] Life of Com. R. F. Stockton, 128.
[33] Report of Com. Stockton to Secretary of Navy, Feb. 18, 1848.
[36] Report of Com. Stockton to Secretary of Navy, Feb. 5, 1847.

abandoned their position before they reached the top, leaving the victors in possession of the field, near which they encamped for the night.[35]

On the following morning the Americans resumed their advance upon Los Angeles. After proceeding a few miles across the plains of the Mesa, the Californian cavalry appeared upon their flanks, and soon their main position came into view. As soon as the Americans came into range, their artillery opened fire, while their cavalry made a furious charge on both flanks. The Americans at once formed a square, and in this position easily repulsed the attack of the enemy; who then retired northward.[35] The Americans continued to advance and on the morning of the 10th of January, 1847, they took possession of the capital.

These two battles, of San Gabriel and the Mesa, decided the fate of California. The people made a brave and gallant effort to maintain the supremacy of Mexico, and had they had better leaders, they surely would have succeeded. Their scattered forces, still under Flores, a few days after their defeat, met the American "California battalion" under Colonel Fremont, and, being unable to offer any assistance, were compelled to surrender. By the terms of the capitulation—treaty of Corvanga—the Californians were pardoned for all past hostilities, were free to go to their homes on giving up their public arms, and promising not to take up arms again during the war. They were guaranteed protection, with all the privileges of American citizens, without being required to take the oath of allegiance.[36] This last blow effectually broke the spirit of resistance to American authority.

Such was the occupation of California. In the opinion of Burgess, it was of the most vital importance to the United States. It is the way to Asia. Its government by Mexico was a farce. It would have been purchased or seized by Great Britain, or some other commercial power, if the United States had not taken possession of it. Nothing was known of its vast mineral wealth at the time. Mere greed therefore, did not prompt the movement. It was a great and correct stroke of public policy, supported by geographical, commercial, and political reasons.[37]

[35] Report of Com. Stockton to Secretary of Navy, Feb. 5, 1847, and Feb. 18, 1848.

[36] Copy of the Articles of Capitulation, in Report of Secretary of Navy to the President, 1848, p. 1067.

[37] Burgess, 332.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

COURAGE AND PRUDENCE.[1]

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IMPORTANCE OF COURAGE.

The great ideas underlying the military professions are the idea of glory and the idea of courage. Even in the earliest times, and even among barbarous people, the brave doings of heroes were chronicled in prose and verse. Nothing stirs the blood like stories of adventure, and none have ever been so glorified as they who have done brave things. There is no man so savage, or so cultured; there is no woman so low or so refined, as not to thrill with stories of deeds of prowess and of daring. This is true especially of the feats of individuals. Homer and Virgil sang the praises of their heroes; all through the Middle Ages the chivalric deeds of King Arthur, Cœur de Lion, and El Cid were told in song and story; and in modern times the valor of Decatur, Cushing, and Hobson shines with a lustre that will never die.

But it is not only the heroes who have done deeds of individual daring upon whose brows mankind have placed the immortal laurel, but also the great chieftains, who, upon the land and the sea, have led armies and fleets to victory. Whose glory can surpass the glory of Alexander, who dared to war against the army of King Darius, which was more numerous than his; of Cæsar, who dared to cross the Rubicon; of Washington, who dared to pit his little force against the armies of Great Britain; of Napoleon, who dared engage the armies of all Europe; of Nelson, who dared to leave the column off Cape St. Vincent, without orders; and who again and again, throughout his brilliant career, dared to disregard orders which his genius told him were mistaken; of Farragut, braving the unknown dangers of torpedoes and rams before New Orleans and Mobile; of Grant, making gigantic movements in de-

[1] The INSTITUTE would like to receive discussions of this essay, particularly in regard to the subject of fire control.

fiance of instructions; of Dewey seizing the critical instant to attack and defeat the divided Spanish forces (the shore batteries and the fleet) which, together, were overwhelmingly superior to his own; of Togo, patiently awaiting his coming foe in the correct strategic place, then annihilating him with neatness and precision, when the decisive moment came!

All the literature of the world that bears upon naval or military subjects exalts, directly or indirectly, the quality or courage. This stimulates men to courage, and doubtless it is a good plan to stimulate men so; because without courage, no naval or military operation could succeed; and inasmuch as self-preservation is the first law of nature, a very strong and natural feeling must be overcome in order that a man shall be courageous. Courage has always been esteemed the principal quality in a naval or military man. Among the Romans the word for virtue meant courage when applied to a man.

PREVALENCE OF COURAGE.

Yet it is an extremely curious fact, and one well known, that, despite the almost innumerable failings and vices of men, exhibitions of physical cowardice are very rare; and it is a well-known fact that, among the soldiers and sailors of our army and navy, it is more difficult for the officers to hold the men back, than to push them ahead. In fact, they almost never have to be pushed ahead, but often have to be held back.

For this reason, it sometimes seems that a little too much insistence is placed on the idea of courage; and it sometimes seems that an unnecessary amount of stress has been placed upon the idea of dash. If the officers and men of the United States Navy had often failed in courage or dash; if they had usually proved themselves to be cowards or sluggards, there might be more reason for it; but as things are, and always have been in our navy, the incessant talk about being brave and dashing reminds one of an address given to some young paymasters not long ago by a very high official, in which they were seriously counseled to avoid "graft."

It is a fact that, while the officers and men of the navy have often done things they should not have done, no case of cowardice or real failure in an emergency in war has even been proved against any officer or man. Certain officers and men have at times

been accused of cowardice, and some have been accused of lack of ardor in time of war. But it is very easy to accuse anybody of anything. And while it is a lamentable fact that officers of good standing have, at times, made serious charges against brother officers, as at the close of the Civil War, and the close of the Spanish War, and have done the service incalculable harm, the fact remains hard and firm that after careful investigation, those charges have absolutely and always been disproved.

Clearly it is most unfortunate that such a hypercritical spirit should exist—not only by reason of its effect on the people of the country, in giving them a bad opinion of the navy or the army, but because it tends to make every officer afraid to do anything that is not distinctly dashing and "nervy." This is a direct and burdensome handicap on every officer. Disregarding as improbable the idea that such a spirit has been caused by selfish feelings, we may fairly presume that the cause lies in the enormous importance attached to courage, and in a failure to recognize the fact that prudence may at times be as important as courage; and at other times, more important. The virtue of prudence is not popular in the navy, and the writer himself feels that, in setting forth certain advantages of prudence, as he is about to do, he is himself extremely imprudent, and is running the risk of being called by uncomplimentary names.

IMPORTANCE OF PRUDENCE.

It is not the intention to extol the virtue of prudence, at the expense of the more heroic virtues, but to suggest that we ought to strive to combine with courage and dash a proper amount of prudence; to combine defense with offense. Possibly this combination was shown by the North American Indian of 200 years ago, as well as by any other body of men. Of their courage there could be no doubt; and yet an Indian always got behind a tree, or crouched on the ground, when he could.

In the ordinary affairs of life, prudence is esteemed a virtue of the highest order; and it is conceded that success is gained by a proper combination of prudence and daring. According to the temper of each individual, prudence or daring predominates in his character. In the ordinary man, it may safely be said that prudence predominates. Now an ordinary man seldom achieves very great success; but neither does an ordinary man suffer very

great reverses. Great successes and great reverses seem to be reserved for men of daring. "Nothing venture nothing have" is a maxim the truth of which is accepted by nearly everyone, in recognition of the fact that no man can accomplish anything (except by chance) unless he takes some kind of risk. According to the occupation in which the man is engaged, the risk will be of one kind or another. But take some risk he must; he cannot even write an article for the NAVAL INSTITUTE, without running the risk of losing friends.

Without doubt, the results of daring and prudence are to be seen most frequently and most plainly in the business world, simply because there are more men engaged in business than in anything else, and business transactions occur more frequently than any other operations of men. It is only the man who works on a salary that is not taking risks all the time; and even he is taking part, though perhaps passively, in all the risks his company is taking. In the business world, success comes in its most brilliant form to the man who is the most daring, provided his daring is governed by good judgment, and accompanied by prudence. The effect of daring, when not sufficiently governed by good judgment, or, which means about the same thing, when not sufficiently accompanied by prudence, the financial panic of October, 1907, with its thousands of homes reduced to poverty, its ruined fortunes and ruined reputations, with the distressing accompaniments of suicide and prison, most clearly shows.

In the military and naval world, which means simply that part of the world in which men are engaged in doing military and naval things, it cannot be supposed that the laws governing human nature should be different from those governing human nature in the business world, or in any other department of human life. No matter what the occupations of men may be, the operations of their minds, the motives influencing their conduct, and the laws by which they succeed or fail are exactly the same. This being admittedly the case, we must conclude that success and failure in the naval or the military life must depend upon a proper combination of daring and prudence.

That this is so in the operations of armies seems hardly necessary of proof. The results of too great prudence or of too great daring are shown upon countless pages of history. Probably a great many more failures have been due to excessive prudence

than to excessive daring; for prudence is often only a euphemism for cowardice or inertia. The greatest armies have usually been those that have shown the greatest energy and daring.

Yet it has not been courage alone that has won battles, even when the opposing forces have been equal in numbers and intelligence. This was shown in brilliant colors in the war between France and Prussia; and still more brilliantly in the war between the armies of Russia and Japan. In both wars, the fundamental difference between the combatants seems to be, not in courage, but in those measures of precaution, foresight and preparation by which the armies of Germany and Japan defended themselves against many sources of surprise, defeat and loss. It is no stretching of the meaning of the word "prudence" to say that those defensive measures, those measures of foresight and precaution, were measures of prudence.

In naval matters we all agree, at least in words, that prudence must be combined with daring; but in some ways, we hardly seem to have recognized this fact as clearly as we should. And it seems most important that we should recognize it, lest some day we meet disaster at the hands of a foe more wary than we. The very temperament of our people shows that such a warning is probably required. As a nation, we are more ardent and headstrong than any other. This fact is so well known as hardly to need proof; but if proof be desired, it is merely necessary to point out that no other nation rushes at such headlong speed into all sorts of enterprises; and that no other nation comes anywhere near us in the number of railway accidents, automobile accidents and financial panics; and as we of the navy know to our sorrow, no other navy has had nearly as many accidents in turrets.

While these accidents in turrets were caused by a perfectly justifiable endeavor to excel, and while the results of the endeavor have been beneficial in the extreme, yet nevertheless the accidents do indicate a conformity on the part of our navy to the national tendency to rush headlong; and the accidents suggest the possibility of defeat in battle, simply because of some casualty preventable by prudence.

EFFECT OF NAVAL LITERATURE.

The naval literature of the past few years has tended to confirm our naval officers and men in the national tendency to "let

her go." Where there can be found one word of praise for any wise measure of precaution, there are a thousand words—almost yells—for deeds of daring. The naval battles between the English and the French and Spanish are always instanced to prove the value of daring. They show, or seem to show, that the daring tactics of the English were better than the prudent tactics of the French and Spanish. Certainly the English, especially at Trafalgar, were victors over a larger force. But is it logical for the historians of those battles to teach that such tactics teach a lesson *always* true? Is it logical to ignore the facts that the French fleet was terribly handicapped by the loss of officers in the Reign of Terror, and that the Spanish fleet was miserably untrained? Had the Spanish and French fleets been as well trained and officered as the English, it may well be questioned whether the British would have been able to stand down in column, as they so often did, towards the French and Spanish ships, firing upon them with their broadsides. In cases where armies or fleets have fought against careless, untrained, ignorant, cowardly or lazy foes, it has seemed almost impossible to be too dashing or too daring, as is exemplified by the wars between the Greeks and Persians, and the wars between Napoleon and the Austrians in the north of Italy. The lesson from them alone would be "L'Audace; toujours l'audace." But such stories as that of the attempted invasion of Russia by Napoleon teach a vastly different lesson.

RESULTS OF COURAGE WHEN NOT COMBINED WITH PRUDENCE.

Now, while our navy seems so infatuated with the quality of daring, that it seems to be thought almost the only military virtue, it may be well to recall the fact that Napoleon's invasion of Russia was a deed of daring of exceptional vastness and magnificence; and yet that it ruined Napoleon with a completeness that has few parallels in history. It ruined Napoleon so completely, that it balanced absolutely and hopelessly, all his former triumphs. Waterloo gave the *coup de grace*, but Waterloo was the inevitable result of Moscow. Napoleon was not compelled to invade Russia. Had he not invaded Russia, and had he followed a policy of prudence, and exerted his extraordinary talents towards the maintenance of friendly relations abroad and the development of solid prosperity at home, he would have lived and died in glory, and his dynasty would have followed him upon the throne of France. But

too much daring lost him everything that all his victories and all his diplomacy had gained. He was exactly like a successful plunger who lives in ostentatious splendor for a few brief years, and then drags out his declining years in poverty and discomfort, during the time when men need money and comfort the most.

Fate of Napoleon.—Napoleon, the incarnation of restlessness, was doomed to six years of hopeless and dull inaction, a prisoner on a remote and lonely little island. Did all his victories do him any good then? A successful man is a man who is successful in the end. The world is full of people who succeed for a while, and then fail; but the world does not usually count such men successful. To live in magnificence for a few years, and then perish miserably, an exile in prison, is a lot that probably no sane man would accept in advance; yet that was the lot of Napoleon. Few men have lived more magnificently for a few years; and few have perished more miserably.

It may be answered that the fame of Napoleon's victories will always live. Yes; but the fact remains that by one act, he nullified the practical effect of all his victories, not only for himself, but also for France. He ruined not only himself, but the cause he fought for. Even the brief success he had, is not an inspiration to right thinking men; because his methods and his motives were as sordid, as selfish and as disingenuous as those of any pawnbroker. If he had been an ordinary man, he would probably have lived in comparative obscurity, and have passed his declining days in comfort and among his friends. What would have happened to France is hard to guess; but it is hard to imagine greater sufferings that she went through, because of Napoleon's wars; or less of *substantial* gain.

War between France and Prussia.—Something like this may be said of the war between France and Prussia. France had absolutely no good reason to go to war; and it seems sure that if she had not shouted "A Berlin" so much, and had had less "élan," and more prudence, she would have studied the situation carefully, and have ascertained beforehand that she could not possibly succeed *until she had made better preparation.* Had she done this, someone of Napoleonic blood would probably now wear the diadem of France.

And even after the war had once begun, a little more prudence, a little less "élan," would have prevented those charges of cavalry,

so gallant, so glorious, so dramatic, and yet so tragic and disastrous, which were hurled in compact masses against hostile lines, under the coldly, mathematically precise fire of the artillery of Prussia.

War between Great Britain and the Boers.—And in the war between Great Britain and the Boers, the brave and imprudent British soldiers rushed to their destruction on open plains, and in narrow defiles of the mountains; while the Boers, lying prudently behind natural and artificial defenses of all sorts, picked them off as easily as they were accustomed to hit targets in target practice.

Naval Actions.—Passing to naval actions, as more instructive to us as naval officers, it may be pointed out that, as with armies, the proper mixture of courage and prudence used, must depend on the conditions existing. A certain mixture may be the best under one set of conditions, and against one kind of foe, and the worst with others. A very glaring instance of a total abandonment of all prudence is the sortie of Admiral Cervera from Santiago harbor. The fact that Admiral Cervera himself did not wish to make the sortie does not nullify the fact that he did make the sortie.

Almost the same thing may be said of the action fought by Rojestvensky against Admiral Togo. The attack by Rojestvensky could not possibly succeed. Here again the fault lay not with the admiral but with the home authorities. The attack was very daring, but it ended in horrible disaster. We can go further and declare that this whole expedition, like that of Cervera, was characterized by imprudence to a Quixotic degree. It may be objected that something had to be done; but it is pertinent to point out that, as illustrated in the expeditions of Cervera and Rojestvensky, there is no use in doing something, unless one does the right something; and that, if one does the wrong something, conditions are made worse instead of better.

In the case of Rojestvensky, it was possible, by the exercise of prudence, by waiting instead of dashing, to do the right thing; because Russia was very much richer than Japan, and it was possible for her to send an expedition to Japan, *in due time,* which could defeat the Japanese fleet, give Russia the command of the sea, and prevent Japan from supporting her army in Manchuria. It is plain that what Russia ought to have done was to send a fleet out there strong enough to accomplish this. And she could have done it, in due time. Russia could get plenty of money, much

more than Japan could, so that she could get a larger and better fleet than Japan; and it was within her power, had she exercised the necessary persistency and patience, to drill that fleet just as well as Japan could drill her fleet. It was also within her power to buy or build as many auxiliaries of all kinds as she needed. Of course, it would have taken a long time to make all the necessary preparations; but *the preparations were essential to success,* and it was imprudent to send the fleet until they had all been made. As to the time required, it would have been a long while; possibly years. But Russia could have stood this delay very much better than Japan could; in fact it would have given her very little trouble. In the end, the fleet would have gotten out to Japan, it would have whipped the Japanese fleet, the Japanese could not have remained in Manchuria, and Russia would have been the victor and not Japan. Instead of this, Russia failed to exercise the necessary patience and persistency; she could not wait till things were ready; she did not mingle prudence with daring; and she lost, probably forever, the result of a hundred years of work.

In the case of Cervera, as his was the inferior force, probably the best thing Spain could have done was to keep his fleet at home, and wait for the American fleet to come to Spain. They would have gone there; and Cervera could have fought them there under conditions much more advantageous to himself than he found in Cuba, far from his base of supplies and coal. Here again we see the disastrous effects of too great adoration of the spectacular and brave, and too little regard for humdrum prudence.

NEGLECT OF PROPER DEFENSIVE MEASURES IS IMPRUDENCE.

But it is not only by *doing* things unduly rash that one may be guilty of military imprudence. To *neglect* proper means of defence and protection would be an act of military imprudence. An army officer, advancing to an attack, who failed to take advantage of every means offered by the nature of the ground, to give protection to his men, would commit an act of imprudence so serious that he would stand in danger of court martial.

And shall not we be guilty of military imprudence, if we fail to give as much protection to the officers and men of our ships as possibly can be given? And do we give it? In our eagerness to

develop our offensive power, have we neglected defensive measures at all?

ORDNANCE MORE INTERESTING THAN ARMOR.

During the past five years, we have been going through a period of enormous change and improvement in our gunnery and ordnance; in our means of offence. All the officers of the navy have been concerned in it, in a greater or less degree; all have been interested in it, and some have worked extremely hard. Hundreds of thousands of dollars have been spent, all the guns in the service have been changed in one way or another, the powder has been made much better, the methods of training the men have been very much improved, and the skill attained at target practice is beyond the dreams of only a few years ago.

Now this work has been beneficial in the extreme, not only as regards the ships and the men, but in the interest given to the navy by the people of the United States. The interest which this work has awakened in them, and the approbation which it has elicited, have approached enthusiasm. Such work is stimulating in the highest degree. It is along the line of visible progress. It is much more interesting than arranging armor. Since we all prefer interesting work to uninteresting work, we are apt to work more at one than the other. Have we done so?

IMPRUDENCE OF GIVING MORE ATTENTION TO ORDNANCE THAN TO ARMOR.

Is it a fact that within the past five years, we have devoted ourselves ten times more to developing our means of offence than our means of defence? If so, we are like a chess player, who seeks to checkmate the opposing king, without being sufficiently careful to prevent his own king from being checkmated. This kind of way of working is characteristic of ardent temperaments; and, as suggested earlier in this paper, it is inculcated in us by nearly all of the things that are written and spoken, about naval and military things.

The principal way in which there seems to be shown very clearly a lack of interest in defensive measures, as compared with offensive measures, is the matter of the conning-tower. It has been well known for 20 years that our conning-towers are not so constructed as to enable the captains to fight their ships while in

them. And yet no *determined* effort has been made to design better ones; no effort like the effort to improve the gun sights, for instance. Conning-towers kept getting worse, instead of better, for years, until perhaps, two years ago. But even now, there is not a good conning-tower afloat. If the matter were trivial, then it might be a piece of destructive and offensive criticism to mention it. One single instance, however, is sufficient to show that this matter is so important that *no other matter concerning a battleship is more important.*

The Conning-Tower of the Czarevitch.—This instance is the explosion of a 12-inch shell somewhere near the conning-tower of the *Czarevitch* in the battle of August 10, which killed Admiral Witthoff, and wounded the captain. Up to this instant, the Russian and Japanese fleets had been running in parallel columns, and neither seemed to have much the better of the other; though whatever advantage there was, seems now to have been on the side of the Russians. Had it not been that the Russian admiral was killed, there is absolutely no reason to suppose that the Russian fleet could not have reached Vladivostock. In fact, the early ceasing of the pursuit by the Japanese, and the now well-known injuries of the *Mikasa,* combined with the fact that it was not necessary for the Russians to defeat the Japanese, but merely to keep going until the Japanese ammunition was exhausted; all these things indicate that, had it not been for the killing of the admiral and the wounding of the captain, the Russian fleet would have got to Vladivostock. It is true that the helm of the *Czarevitch* was jammed hard over; but this was a temporary matter and was very soon rectified.

Many writers deem this battle the critical battle of the war; saying that, if the six battleships had gotten away, they would probably have joined with the three large armored cruisers, and all would have gone to Vladivostock.

In this case, it would not even have been necessary for them to have fought a battle until the arrival of Rojestvensky; for they would have constituted a " fleet in being " of such force as to have practically paralyzed any attempts of the Japanese to maintain communication with Manchuria. Without any battle whatever (though probably they would have had a battle) they could have held command of the sea, or at least have prevented Japan from holding it. Meanwhile, Rojestvensky could have formed his

fleet at his leisure. Knowledge of this would have been all over the world. Not only would Japan's operations in the transporting of troops and supplies to Manchuria have been so handicapped as to be practically paralyzed, but the Japanese would have known that it would be only a question of time before they would be crushed to annihilation between two Russian fleets, one coming from Vladivostock, and the other coming from Russia.

Startling as it may seem, therefore, there seems little doubt that the war between Japan and Russia was lost by Russia, because the admiral and the captain in the *Czarevitch* did not have properly designed conning-towers!

Does it not seem a little strange then, that, knowing, as we do, that the war between Japan and Russia was lost by Russia on account of an accident, which would not have occurred if the *Czarevitch* had had properly designed conning-towers, does it not seem strange, not only that we have poorly designed conning-towers, but that we have made no *determined* endeavor to design better ones? It is not because no suggestions have been made; it is simply because they have not been acted upon. More than six years ago a suggestion was made officially of a conning-tower considerably higher than a man, supporting a roof through which a periscope projected. Why not, at least, have tried this idea? It could have been tried perfectly with a wooden conning-tower for perhaps three hundred dollars. But the official to whom the suggestion was made, dismissed it with the extraordinary statement that "the mirrors would distort the image!"

Bad Defensive Arrangements by Russians at Tsushima.—The fact that battles may be lost by insufficient defensive arrangements is convincingly shown to those who read between the lines, by the accounts of the battle of Tsushima. In nearly all the writings on the subject, tremendous stress is laid on the strategy and tactics of Togo and the excellent gunnery of his men. That is, tremendous stress is laid on the *offensive* measures. The writers consider it marvelous that so many ships were disabled in less than an hour, and they wonder that the Japanese gunnery was so much better, and did so much more execution than the Russian gunnery. Yet their own accounts disclose the fact that one great reason why the Japanese shot so much better than the Russians was that the Russian ships had a lot of coal on deck, *so that they rolled a great deal.* Their own accounts also show that the great reason why the

Japanese gunnery was so effective was that, on account of this disposition of the coal and the consequent rolling and changing of the water-line, Japanese shot penetrated the soft places, and water entered.

Another reason for the defeat of the Russians by the Japanese seems to be the flame given off by their exploding shell. This does not mean that the Russians gave less protection to their men than the Japanese did, in fact, we are quite sure they did not. The fact, however, of the destruction of the men on deck and aloft in the Russian ships, shows how advantageous it would have been to have had some protection against the flame.

Bursting Shell at Chemulpo and the Yalu.—A still more striking illustration of the effect of bursting shell on exposed men, is the killing and burning of the men on board the *Variag*. Every man aloft was either killed or wounded; and men on deck were simply burned to death, without being struck by any projectile whatever. And the frightful effects of fire at the battle of the Yalu must not be forgotten, though happening ten years before.

Protection for Signalmen.—Another way in which perhaps we seem to have been imprudent is in not providing adequate protection for the signalmen: protection which shall protect, yet permit signaling. By the present plan, the signalmen stand on a bridge entirely exposed, with scores of combustible flags about. Nobody expects that signals will be used much during the actual heat of action, and yet we all know that we might like to have some signalmen left afterwards. Even if we do not expect to do *much* signaling during the actual action, yet we know that it might be very advantageous to be able to do some at a critical moment, *as has often been the case in the battles of the past;* and we also know that there is no especial advantage to be gained by having our signalmen killed. It does not need much nowadays to kill a man or burn him to death, as shown in the battles of the Yalu, Chemulpo and Tsushima. And while we do not know exactly how our next enemy will attack us, we ought to suppose that he will have ordinary common sense, and take a hint from these three modern naval battles, and attack our personnel, as well as our armor, with high explosive shell.

Sighting-Hoods.—Another way in which we do not seem to show a prudent regard for protection, except in ships now under construction, is in the arrangement of the sighting-hoods on our

turrets. It may be replied that this is being rectified in certain ships now building. This is true; but it is the intention of this article to point out that it is just as important to improve our means of defence as our means of offence. Why then, if we have made such sweeping changes in our *existing* ships, and spent so many hundreds of thousands of dollars to improve *their* means of *offence,* why have we not spent a little to improve *their* means of *defence?* A comparatively small projectile striking a sighting-hood would probably put the whole turret out of commission. What good would all the fine guns inside do then?

Protection to the Compass.—Another thing which we have not done is to protect the compass. A compensated compass, it is true, was put into the steering-engine room of the *Minneapolis,* and one is now in the *Louisiana.* Its introduction into all our ships would enable every ship to steer a compass course throughout a battle, and to get the compass bearing of any ship or object desired. The importance of such a step, should it be taken, cannot be exaggerated. The wonder of it is that it was not done ten years ago, since it is so important and so cheap. Does this not seem to indicate a tendency to overlook measures of prudence?

FIRE CONTROL.

Another matter in which, perhaps, less attention has been paid to defensive measures than prudence would suggest is that of fire control. By the plan which seems now the most highly regarded, and which, for convenience may be called the "present plan," many observers are exposed aloft; and if the results of the battles of the Yalu, Chemulpo and Tsushima re-enforced by the experiments in firing at the "*Hero,*" give any true indication whatever, all the members of the fire-control party will be either shot to death or burned to death in a very short time. It is often said that in war we must expect someone to get hurt; that one cannot make omelettes without breaking eggs, etc. Yet, if the fire control party are to be of any use at all, should we not try to prolong their lives, and therefore their usefulness as long as possible? Now in the very beginning of the battle of the Yalu, a shot struck the fore military mast of the Chinese flagship *Ting Yuen,* killing seven men in the top, and bringing it down: the shot that killed Admiral Witthoff put nineteen persons hors de combat; and the shot that just missed Togo wounded his chief of staff and the captain of the ship.

It may be answered that there is no way to having fire control, without having many men exposed; and that the "present plan" will insure a more accurate fire than any other plan, so that we must sacrifice everything in order to use it. Yet there is a plan which sems to permit of a more accurate fire, and not to involve so much exposure of men. The writer begs leave, therefore, to suggest this plan, part of which is not original; and in order to bring out clearly a few points, he begs permission first to point out certain features of the "present plan," the adequacy of which seems questionable.

In the first place, the "present plan" suggests the idea of having been designed to meet the needs of target practice, without pausing to consider analytically whether the needs of target practice are so nearly like the needs of battle, that a system of fire control that is good for target practice will necessarily be good for battle also.

It might be argued with perfect fairness that the burden of proof as to the adequacy of the present plan belongs on the people who have proposed it; because the act has been a positive act, and should be capable of a positive explanation and defence. But it is not desired to do this: but rather to analyze as closely as possible the relation between the conditions of battle and the conditions of target practice, in order to determine whether a system of fire control that is good for target practice, will necessarily be good for battle.

It must be understood clearly that what is here written is intended as no dispraise of our system of target practice, and the brilliant results it has achieved. Only praise of the warmest kind can be accorded to the wisdom and the energy with which the mechanism of the guns, turrets, and torpedoes has been improved, and the enthusiasm with which officers and men of all ranks and ratings have worked together in the common cause. During the past five years, the improvements in mechanism and in the skill of officers and men have been little short of marvelous. But target practice is not the subject of this paragraph and those following; rather the essential difference between target practice and battle, in relation to the selection of a plan of fire control.

There are two principal differences between target practice and battle: one that the sea at target practice is always smooth, and the other that the target does not hit back.

At first sight this remark may seem childish; and it may be pointed out in objection that target practice must be held in smooth water, because competition among the gun-pointers is essential to success, and competition can be had only when the conditions are identically the same for all; which is only when the water is smooth. It may be objected also that it would be impracticable at target practice to have a target that would hit back, in the way the enemy would in action.

Of course these statements would be true. Of course target practice must always be held in smooth water, and of course it is impracticable to have the target hit back. It may be admitted, besides, that our gun-pointers will shoot better in rough water by practicing in smooth water, than if they did not practice at all.

These things being understood, we may now consider what the present system of fire control consists in, what it can be expected to accomplish in target practice, and how the difference between target practice and battle may be supposed to affect it.

The present system, disregarding details, may be said to be a system in which a range-finder gives an approximation to the sight-bar range, which is used for the first shot; and a group of observers aloft, who note the relation of the splash to the water-line of the target, and who continually correct this shot and succeeding ones, in such a way as to keep the center of impact on the target, changing as needed both the range and the lateral correction. That is, of course, well known everywhere.

There are two principal methods for ascertaining the amount of correction. One is called "vertical spotting." The diagram showing this method as regards range correction, is given in various unofficial publications, and is substantially as follows:

This diagram is distorted in the sense that the scale is different for the horizontal dimensions than for the vertical dimensions. For instance, if the observer occupied the station *A*, 100 feet above the water, on a mast, and if the distance *BC*, which in the diagram is three inches long, indicated 6000 yards, then the

height *AB* should be only 1/60 inch, instead of ½ inch, as drawn. The angle of the splash below the water-line would, therefore, be 1/30 of the angle *ACB* shown. If binoculars magnifying 10 times, however, be used, then, disregarding the effect of vibration, the angle would *appear* to be, not 1/30 but 10/30 of the angle shown.

The other method need not be described, as it is well known. It is sufficient for the purposes of this paper to say that it is one of those numeous plans for correcting the range used, by observing the fall of the projectiles, that have been proposed, and more or less used, for many years.

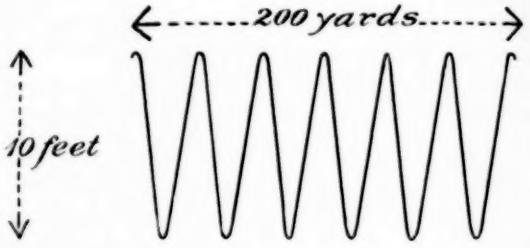
If the inherent errors in the guns themselves were small, as they are; if the powder and projectiles were as carefully made and handled as is coming now to be the case; and if every gun was fired by an expert gun-pointer, of whom we have many now; it seems probable that both of these methods would fulfil satisfactorily the functions of fire control for target practice in smooth water. The only doubtful factor would be the exactness with which the gun-pointers pressed their firing buttons; but in perfectly smooth water there is no reason why, considering the excellence of our gun mechanism and the skill already acquired by the gun crews, including the pointers, the guns should not be fired very nearly at the right instant. In perfectly smooth water, the ship rolls so very little, and the cross-hairs rest on the target so long a time, and move from the target so little and so slowly, that (as our practice has already shown) the shots group together very closely; and one is justified in assuming that each splash is due to a projectile that was fired as ordered.

To assist the observers in correcting the range by observing the fall of shot, in case the range changes, an instrument is employed which is well known and need not be described here, by which the rate of change of range of the target can be ascertained; and also another instrument which can be set at this, so that the sight-bar range, being once found, the instrument will continue to show the range until a new rate of change is discovered to exist.

Coming back now to the first method, it may now be inquired whether the conditions of battle are so different from those of target practice as to make it unavailable for battle.

An answer can be quickly gotten by simply drawing with some

approach to correctness, the diagram already shown. It will be noted that in that diagram, the horizontal line *BCD* is perfectly straight. It may be objected that if the distance *BC* is only three inches long and represents 6000 yards, it ought to be drawn perfectly straight; and that no waves, even those that are in the roughest water, would make it appear otherwise than straight. This is true; but the line *AB* represents 100 feet, and if this is the scale of vertical heights, then the vertical heights of waves must be drawn on the same scale. Clearly, it is not accurate to represent some vertical heights on a certain scale and represent others on another scale. Now, inasmuch as the only use for training our gun-pointers is for battle; and as it is practically certain that any future battle in which our fleet will engage will be on the open sea; and inasmuch as the waves there are as high on the average as 10 feet from crest to hollow, we can see that the diagram in question should not have the distance *BC* represented as a straight line, but as a wavy line, in which the distance between waves is drawn on the scale on which *BC* is drawn, and the heights of the waves are drawn on the scale on which *AB* is drawn. Supposing the waves to be 100 feet apart and 10 feet high, the diagram or rather 1/10 inch of the line *BC*, magnified 20 times, for distinctness, would look a little bit as follows:



This diagram is, of course, itself imperfect, not only because the necessity for magnifying the size of the waves makes it impossible to show more than a small part of *BC*, but because waves of the ocean are not immovable like the curves shown in the diagram, but rise and fall continually, and in an extremely irregular fashion. If one will now exert his fancy so as to imagine that these various curves are moving like the waves of the ocean; and if he will also remember that the part of the ship (the foremast) which is the natural point of aim, is itself rising and falling above the true

level of the sea, he will be able to see that an observer at *A* has absolutely no data from which to form anything but a guess, as to the distance of any splash short of the target.

Passing to the second method, and granting that it may be adequate for the purposes of fire control at target practice in smooth water, the question may now be asked: Are the circumstances of battle at sea, for which alone it is desired, so like those of target practice in smooth water, that the method will surely be adequate for battle at sea also?

In the first place, we all know that there is no method, either for target practice or for battle, of finding the correct sight-bar range of any gun, by any means except trial. So, recourse must be had, at first, to trial shots and observations of them from aloft. These trial shots are like those of the marksman at Creedmoor, who, though he knows the exact range of the target, needs nevertheless to find his own sight-bar range. At naval target practice, and probably in battle, the time and the ammunition needed to find this sight-bar range can be lessened by using a range-finder in order to get an approximate sight-bar range, to start with. In fact, in order to get on to the target as soon as possible, a range-finder and an observer aloft are essential.

Of course, the question of determining the correction to be applied to the range indicated by the range-finder, by data gotten by observations of the fall of the projectiles, comes under the theory of probability; and, if all the available factors be given their most probable values, the question becomes difficult in the extreme. It does not need any recourse to mathematics, however, for us to see that *the time and the ammunition required to get the correct sight-bar range are great in proportion as the conditions of accurate firing are difficult.* If the sea be smooth, and the rolling slight, and if the target does not shoot back, the splashes will be in their correct places; and, for that reason, correcting the range-finder will be easier and quicker, and will cause very much less waste of ammunition than would be the case in battle, with a ship rolling in any ordinary sea way, and the enemy shooting back.

Now *this matter of the amount of time and ammunition needed to get on to the target is very vital to the question of fire control.* The results of our target practice in smooth water have been such as to suggest that the grouping of the shot in battle will be such

as to make continual correcting from aloft possible, not only for the first trial shots, but *throughout the battle.*

But from the mere standpoint of the rolling of the ship, we may well stop to consider whether this will be the case. In absolutely smooth water, the ship does not roll at all; and the horizontal cross-wires rest almost immovable on the target. Supposing, as we have a right to do, that the sight-setters and the trainers do their work correctly, what skill is required of the gun-pointer? He simply presses the button, and the powder does the rest. A new projectile and charge are inserted, and the same thing happens. Supposing the sight-bar range to be given correctly, both projectiles go through the target, and the gun-pointer gets a lot of glory; but what has he done? Under the conditions just stated, no human power could have stopped him from hitting the target.

This may be called an extreme case, and yet such cases have occurred at target practice. As a rule, of course, there has been a slight motion.

But see how all is changed when one tries to fire a turret gun in a sea way. We really do not know much about it, because we do not practice at firing heavy guns in a sea way. But by rolling practice, or by watching the horizon at sea, anyone who has ever taken hold of the controller, and tried continuous aim, knows how difficult it is; he knows how very discontinuous the aim is. The same thing may be said of the so-called Morris-tube practice with a turret gun. As to knowing when to press the button, when rolling in a sea way, how can a man learn? To learn, he would have to practice in a sea way, firing at a target, and would have to be informed exactly where his shot fell; just as at target practice now.

At sea, even in good weather, a roll of half a degree per second is rather small; but even with as slow a roll as that, the sights of a turret gun would sweep over 30 feet of vertical target at 6000 yards in the fifth of a second; that is, if the gun-pointer is to hit that target, or if his projectile is to fall in the corresponding horizontal rectangle, he must press his firing button at a certain instant which must be a certain interval of time before the horizontal wires rest on the target. The length of this interval of time is, of course, independent of the *rapidity* of rolling; but the gun-pointer must not *err* more than 1/5 second. If we could give our gun-pointers practice in firing at sea, under these conditions, they

would doubtless acquire considerable skill; but this we are unable to do. The most we can do is, for reasons that are well known, to train them by firing in smooth water. But while it is true that they will be able to fire much better in rough water by learning to fire in smooth water, than by not firing at all, we know perfectly well that nobody ever yet acquired very great skill in doing one thing by practicing at another thing. So well recognized is this fact that expert billiard players always use the same cue, and expert marksmen the same musket.

Not only must we recognize the fact that we can never get the same close bunching of projectiles when rolling in a sea way as we can in target practice in smooth water, we must also recognize the fact that we do not know, even approximately, how the gun-pointers will fire under conditions of rolling, and how their shot will bunch. It is, and probably will be for a long time, an unknowable thing. All we can know is that they will not fire so correctly, and the shot will not bunch so well, as at target practice in smooth water; and that it will take a wholly hypothetical length of time and waste of ammunition to get the sight-bar range. Our knowledge of this matter is exclusively negative.

Another condition of battle, unlike that of target practice, which tends to make difficult the correction of sight-bar range by observations of the fall of shot, is the fact that the enemy shoots back. *In order not to waste time and ammunition in correcting ranges, it is important, as just said, that the gun-pointers should fire with extreme correctness.* Now if it is difficult to do this, when the ship is rolling; if it requires a very accurate judgment to estimate the time interval, as the cross-wires move towards the target, even under conditions of the greatest tranquility, what will happen when the enemy is replying? We simply do not know. In the first place, we have no data to reason from; and in the second, the men get no training in firing in battle, and get no practice in pressing their firing buttons correctly, under the conditions of battle. Of course all training is good; but naval battles occur so seldom, and under such differing conditions, that all we can say is that the fact that the enemy will fire at us will tend to lessen the accuracy of our own fire; and, therefore, to increase the time and ammunition needed to correct the ranges given.

Reference has been made so far merely to the conditions at the guns. But what shall we say of the difference of conditions be-

tween target practice in smooth water, and battle on the sea, as presented to the observers aloft themselves? Whatever method of observation from aloft be employed, it is evident that, even supposing the shots to group as well as at target practice, the work of the observers aloft will be of the most delicate kind. It is difficult to realize any job that could be given to mortal man, not excluding that of the admiral or captain, requiring such absolute presence of mind, and such persistent concentration, as that needed of every member of the fire-control party. Any member of a gun's crew, in fact anybody else in the ship, can get some relief by physical exertion of some sort; or, if he be a gun-pointer, can press his button and feel his gun fire. But every member of the party aloft must do nothing but use his brains, with a little assistance from his eyes. The most perfect self-forgetfulness will be required of everyone. No one must be diverted by any accidents happening to his own ship, or by anything going on in the panorama before him; and such things as shrapnel and high explosive shells bursting near by, and the foremast going overboard, he must utterly ignore.

Now, as has just been pointed out, it is probable that the shots will not group well, after the battle once gets under way; so that the difficulty of judging what correction to apply will become more and more perplexing. Coincidentally, the conditions of the battle will make any mental operation whatever more and more difficult to perform.

Furthermore, *erroneous corrections, like erroneous administrations of medicine, do much more harm than good;* not only this, they complicate the situation, and render further operations more difficult to carry on successfully.

But, besides the great difficulty of making correct observations from aloft, throughout the heat of battle in a seaway, and the resulting waste of time and ammunition, in continually correcting the sight-bar range, attention may be directed, perhaps profitably, to the great and prolonged exposure of the observers themselves. And in considering this matter we must not forget that *the foremast will be the natural target of the enemy.*

It seems probable that, before the fleets get within gunnery distance, they will form in converging columns and gradually close. During this interval of closing, the rate of change of range will probably be very gradual, as each side will be trying to

get the best work out of its broadside fire. During this interval of closing, the observers aloft on all the ships of both sides will be very busy. They will have been preparing for this event for a long time before; and with any enemy with whom we shall probably engage, the observers and the gunners will probably be as skillful as our own.

Soon the fleets will probably line up in parallel columns. It seems probable that they will then run a race for quite a while, during which the rate of change of range will be very small, and the rate of destruction at its maximum.

It seems probable, judging from history, that the next phase of the action will be the phase when injuries become apparent. A mêlée more or less pronounced will ensue. The precise order of the battle will give place to one in which the vessels of both fleets will be going in various directions, and at various and variable speeds. The hostile ships may not be close together—so that now would be the time when a good system of fire control would have a price above rubies. But how many observers could anyone expect to remain aloft—alive and unhurt—now?

Of all the important people in the ship, the most important (excluding the captain) are the fire-control party. We may feel sure that the enemy will have recognized this fact, and will have devoted a very considerable part of their battery to attacking them directly with shrapnel and explosive shell. When it is considered, in the light of the battles of the Yalu, Tsushima, and Chemulpo, how easy it is to kill and burn exposed men, and how small an amount of injury suffices to disable a man, it seems fair to conclude that the observers aloft would have been put out of action. It may be replied that other men would have taken their places; but this seems a little impracticable. All the men in any ship have stations of their own, where they are needed, even before the total complement begins to be reduced by casualties; and, furthermore, they would be merely understudies; not as expert as the regular party, and without that clear knowledge of the previous events of the battle which would be necessary, if they were to take up the reins understandingly and skillfully.

Besides, if one remembers how difficult it is sometimes to get word to anybody on board ship, even in normal conditions, he can see that in the case of the observers aloft being wiped out, there would probably be a very long delay in getting the understudies up there.

Now, can anyone imagine a time, or a state of conditions, of which it could be more pertinently said that "delays are dangerous."

Writer's Personal Experience.—At the risk of seeming unduly egotistical, the writer begs leave to state that he believes that he was the first man to attempt, or to carry out, fire control from aloft in actual battle; also that, barring perhaps Japanese and Russians, he believes he is the only man who has ever done it. And it is for this reason that he feels perfect confidence in adopting the conclusion to which the line of reasoning just followed seems inevitable to draw us—the conclusion that *any plan whatever* by which fire control in battle is attempted from exposed positions, must lead us to hopeless and complete disaster.

At the battle of Manila, with the kind permission of the captain, the writer occupied a station which he had rigged up on the foremast of the *Petrel*, about forty-five feet above the water. He used a stadimeter for getting the distance of the *Regina Christina*, adjusting it to such a height as to get the best results, judging from the fall of our shot.

He was able to do this successfully; but fortunately, the Spaniards did not shoot straight, and nothing near him was struck, and no shell exploded in his neighborhood. But . . . . he remembers very clearly that, in the early part of the action, before we had gotten far away from the guns of Manila, a heavy shell from Manila struck alongside, and wet him down and covered the stadimeter with water. He also remembers clearly how deliberately he wiped off the stadimeter with his handkerchief, because for a few seconds he could not trust himself to hold it to his eye. He also remembers that, whenever a shell passed pretty close, it distracted his attention for the moment from his work. Now, if those shells had been passing *as frequently as we must expect in our next war*, and if they occasionally had hit things near by—and if they had exploded—the writer believes that his range-finding would have been extremely inaccurate.

Another illustration very much in order is the case of Yeoman Ellis on board the *Brooklyn*, who was using the stadimeter, to find the range at the battle of Santiago. Ellis was not aloft, but was occupying an exposed position. He was killed, and the instrument was so damaged that no one could use it in the battle afterwards.

It would, therefore, seem that the conditions of battle are so different from the conditions of target practice in smooth water, that any system which depends wholly upon observers aloft, who correct the fire by observing continually the fall of projectiles, *throughout a battle*, could not be satisfactory.

PROPOSED PLAN.

The question is—can a better system be devised? Before answering definitely this question, consideration may perhaps be given profitably to the following reflections.

(1) If the distance of the target ship could be found exactly, if each gun were perfect, if the powder and projectiles were perfect, and if each gun was fired perfectly, then each shot would hit the target ship, and there would be little use for any system of fire control.

(2) If each gun had a perfect range-finder, and if each gun-pointer could be informed immediately after his shot as to how it went, he could soon "get on to the target" as a marksman does at Creedmoor. Furthermore, if the scale of that range-finder could be moved bodily, so that the range-finder man could change the range indication instantly, say from 7000 to 7200, he could, as soon as he got on to the target, make the range-finder read the correct sight-bar range for the index of powder being then used. Furthermore, *he would then become entirely independent of any observer aloft.* That is, he would be independent until a new index of powder were used. But why should a new index of powder be used? Considering the importance of the matter, is it impossible to assign one index of powder only to each turret or group of guns?

Of course there is no perfect range-finder, and of course, it would be impracticable to put a range-finder at every gun. But a certain range-finder of which the writer has intimate practical knowledge, used under the best conditions, can be depended on to show an average uncertainty of not more than one-tenth of one per cent per thousand yards; that is 36 yards at 6000, 49 yards at 7000, 64 yards at 8000 and so on. What impracticability would there be in putting one of these on each turret, and in protecting it and the observer with armor? The armor on the turret top would do no harm, but a great deal of good; because, if placed along the forward end, that is the end towards the enemy, it

would act as a rampart and protect the thin turret-top from projectiles which, coming down at a considerable angle of fall, would be, perhaps, the greatest danger to which the turret would be exposed.

Now what would there be impracticable, *in the early stages of a battle,* in having an observer, as high aloft as possible, handling no mechanism except a pair of binoculars and a telephone, in telephoning down to the communication room information as to the effect of each shot, until all the gun-pointers in the turrets had gotten on to the target, and had set their range-finders at the correct sight-bar range? After that, he could come down—probably.

An incidental advantage of this plan would be that the forward turret would use the range measured from the forward turret, and the after turret would use the range measured from the after turret. In many battleships the forward and after turrets are at least 75 yards apart; so that the range of a target sharp on the bow is 53 yards less from the forward turret than from the after turret.

It may be objected that this plan makes no provision for the intermediate or torpedo-defence battery. Supposing these to be used in battle, as they probably would be, if engaging an enemy whose important men were known to be exposed, arrangements could easily be made to communicate to them, from below, the sight-bar range used in, say the forward turret. After the guns of each caliber of the intermediate and torpedo-defence battery had gotten on to the target, and their correction on the turret's range-finder had been ascertained, the officer charged with communicating to them the range would simply communicate the range as thus corrected: for the correction at ordinary battle ranges would be practically constant.

It may be objected that the reasoning above practically assumes a perfect range-finder. To this objection it may be answered that it does not assume a perfect range-finder; but that it does assume a range-finder which, after the sight-bar range for the guns of its turret has once been found, will thereafter continue to give correct sight-bar ranges, within an error much less than is inherent in observations from aloft under the conditions of battle. It also assumes the fact that *a range-finder is independent of change of range or rate of change of range;* so that, after the sight-bar range has once been obtained, further loss of time and ammuni-

tion, such as is inseparable from the splash method, will not be required.

Let us recognize the fact that, in battle, what must be accomplished is really range-finding; that is, finding the sight-bar range, no matter what method we employ and no matter whether we call it "spotting" or something else. What is needed at each gun is a knowledge of its sight-bar range; and the only question that concerns us is the best method of finding it. If observers aloft, by any method involving the splash of projectiles fired in battle from a ship rolling in a seaway, can estimate a range with an average uncertainty less than 36 yards at 6000 yards, *and can keep it up throughout the battle*, then that method, perhaps, is better than the use of a range-finder; but reasons have been given above for doubting that they can do it. The extreme liability to total destruction of men and mechanism, in all methods requiring observers to use instruments aloft throughout a battle, is perhaps more important than the question of accuracy.

It may be objected that it is not fair to assume an accuracy of a range-finder attained under the best conditions, and compare it with assumed results of dispersion of projectiles, when the ship is rolling. This objection seems good at first sight; but it may be pointed out, and it is very well known, that the ordinary rolling of a ship affects the indications of a range-finder extremely little, provided the observer be well trained: much less than it affects the accurate firing of a turret gun. The reason simply is that a range-finder is much more easily moved than a turret gun.

The interesting fact may here be pointed out that, in one way, it will be easier to get on to the target in battle than at target practice, because at target practice, a shell striking the canvas of a target—say 6000 yards away—cannot as a rule be seen; while a shell exploding against the side of a ship, gives out a brilliant flame. Shells that do not explode cannot usually be seen; but it may be suggested here that, in the case of armor-piercing shell, it might not be difficult to fit a sort of dummy fuse in the nose of the shell, which would explode upon impact and give out flame. Such a contrivance, if found practicable, would assist very much in fire control; because, after all, we are very much more interested in the shots that hit than in the shots that miss. Furthermore, among the shots that miss, the only ones of which we can take account, are the shots that go short; and the amount by

which they go short is very difficult to estimate, whereas the shots that hit are absolutely located. Furthermore, if we count the shots that hit, this does not prevent us from counting the shots that go short; which gives us, by an easy method, the number of shots that go over. The adoption of a device, therefore, showing us positively when a shot hits, would be a means of getting all the data needed for correcting the range-finders, and getting the sight-bar ranges.

LATERAL CORRECTION.

No mention has been made thus far of the need for lateral correction. The means employed in the present system, seem much less harmfully affected by the rolling than are the means for correcting the range, but to be subject to the same disadvantage of extreme vulnerability.

Another plan may be here suggested, in which all the operations are carried on behind armor, or below the water-line. It would also seem capable of greater accuracy. In order to carry it out, it would be desirable to remove all the mechanism from the conning-tower, except the steering wheel, placing that mechanism near the bottom of the armored tube; thus leaving space within the conning-tower for the captain, his aide, and the quartermaster. The armored tube should, of course, be large enough to enable a man to pass up and down it. The slits in the conning-tower should be closed, and the captain given a small periscope, or vertical telescope *of a low magnifying power,* projecting upward through the roof; so that he can see what is going on, just as a man does in a submarine; in fact much better, because his periscope, being shorter, will have a much larger field; and it can be made revolvable, without tilting the images. He will be perfectly safe, if the conning-tower is made strong enough; and his vision will be practically perfect. Forward of the captain's periscope, and somewhat below it, let his aide have a similar instrument, as small as practicable, mounted on a graduated circle, so as to show the bearing in degrees and minutes, from the fore and aft line, of the object at which it is directed. Let the aide take the bearing of the foremast (or other designated object) of the target ship once every half minute, and telephone the bearing to a man, who may be called the "plotter," seated at a table in the communication room.

Let a carefully compensated compass, like those placed below in the *Louisiana* and *Minneapolis,* be placed below where there is the most directive force; and let an observer at this compass telephone the compass heading of the ship once every half minute to the plotter, at the same time the captain's aide telephones the bearing.

Let this plotter have in front of him a board much like a plane table, revolvable around a central vertical pivot; let it be supposed that his ship always occupies the exact center of that pivot. Let there be a graduated circle 2 feet in diameter described about that center and secured to the board, so that it is much like a pelorus. Suppose the plotter hears from the steering engine room that the ship is heading N 20° E. He at once revolves the plane table till N 20° E comes opposite the lubber's point, just as he would a pelorus. Suppose the plotter also hears that the enemy's ship bears 80° on the starboard beam. He at once moves a pointer to the 80° mark shown on a stationary graduated circle around the movable circle, of which stationary circle the lubber's point is 0. Let this pointer be a radius bar with an edge which is in line with the center of the pivot. Let the plotter now draw a line along that edge, and that line will represent the compass direction of the foremast of the enemy. Let this radius bar be divided in units of distance, say 1000 yards to the inch, which would give 100 yards for every tenth of an inch. Let the range-finder man from—say the forward turret—now telephone that the foremast of the enemy's ships is say 7000 yards distant. Let the plotter put a dot on the line already drawn, at the 7000 mark; and this point will mark the compass bearing and distance of the enemy's foremast at that instant, with relation to his ship.

In another half minute, let the same process be repeated; the next half minute and so on; the three communications reaching the plotter at about the same time. Let the plotter continually connect the points established; and it is clear that the line resulting will represent, not the course and speed of the enemy's ship, but its course and speed relatively to our ship.

Inasmuch as, after the first plotting, all the movements would be very small, it would seem that a little practice would enable the work to be done very quickly and very accurately. As everybody would be behind armor, such work would not seem at all liable to error due to excitement, especially as no mental arithmetic would have to be carried on.

It is apparent that this plan resembles very closely the work of "position finding" which is carried on so successfully in our forts. If it can be carried on successfully in forts, no good reason is apparent why it could not be carried on successfully in battleships, especially since, in forts, the work of position finding is much complicated by what is called "predicting"; that is, telling, from the course and speed of an enemy's ship, where it will be at a given interval of time in the future.

The line connecting the points on the plotting board, showing the various positions of the target ship, can be easily used to show the speed of the enemy perpendicular to the line of fire; that is, the lateral correction to be applied to the gun sights. It is merely necessary that there shall be a scale slideable along the pointer, the scale being perpendicular to the pointer, which the plotter, or his assistant, can move along the pointer until it reaches the track of the enemy's ship. The relative speed resolved perpendicular to the line of fire can be read directly from this scale and then be communicated to the battery.

Thus it would seem that we can in many ways improve our means of offence, or rather its continuance, by improving our means of defence, in ways that are quite simple, and, compared with our means of offence, extremely inexpensive.

PRUDENT CARE OF THE COMMANDER-IN-CHIEF.

There is one means, however, which has not yet been touched on in this paper, but which demands attention more than anything else mentioned; and this is the defence, or rather the protection, of the commander-in-chief and his subordinate flag officers. We know that Nelson was shot down on deck; we know that Admiral Togo came very near to being killed, and we know that Admiral Witthoff was killed under circumstances which lost the battle to the Russians, and the whole war. We also know that in any future war, the flagship of the commander-in-chief will be attacked by the concentrated fire of as many ships as practicable.

Are not these facts worth thinking about? Do we not know that under any circumstances we can imagine, the sudden disabling of the commander-in-chief would be the worst thing that could happen to the fleet? Everybody will say "yes," but why do we not do something about it? Why, at least, do we not think about it? Why go on year after year, without even making an

attempt to save that particular life, which, in all the fleet, is a thousand times the most important? We do not even give the admiral a conning-tower!

Why not take a hint from our friends, the army? Do they put the commanding general out in front, or do they put him away back, out of the way of harm? If they put him away back out of the way of harm, he certainly cannot see with his own eyes, what is going on; but yet, in some way, the army manages to have such a system of communication from the various positions at the front, and such a way of assorting this information, that *the commanding general sees what is going on with other people's eyes; and he uses the eyes of so many people, that he really gets a very much clearer mental vision of the whole battle, than he possibly could, if he were entangled in the smoke and confusion of any one part of the battle field.*

Why cannot we do something like this with our commander-in-chief? Why can we not give him a heavily armored, well lighted conning-tower, into which shall be sent communications from the deck and aloft of whatever is going on? Why cannot he have a suitable table, or game-board, on which shall be placed miniatures of his own ships and the enemy's ships, in their proper places? Why cannot his aides be notified continually of the direction and approximate distance of every enemy's ship, from the flagship, and why cannot they continually, in the light of this information, maintain the proper relative positions of all the ships on the game board? Why cannot the miniature ships representing the enemy be painted red and ours blue; and why cannot any accident happening to any ship be indicated by putting some preconcerted mark on the miniature of that ship?

To do all this, a space 10 feet square would suffice, and possibly a half dozen men, counting two telephone operators. A table three feet square would probably be large enough, because only the *relative* positions of the ships would have to be represented.

The advantages of this plan would be that the admiral would be able to continue in command throughout the entire battle, or at least, until his own ship was disabled; and that he would be able to form his conclusions with more clearness of mind, and to make his decisions with calmer judgment, than if he were entangled in the smoke and confusion of immediate combat, and deafened with the noise of guns, and set on fire with explosive shell.

MEMORIAL WINDOW TO ADMIRAL DAVID D. PORTER.
PRESENTED BY THE CLASS OF 1869, U. S. N. A.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ADMIRAL PORTER.[1]

By REAR-ADMIRAL G. P. COLVOCORESSES, U. S. Navy (Retired).

The hero to whose memory this window is now unveiled stands eminent among the men who valiantly served our country in her time of greatest peril and preserved to us the institutions that have so nearly realized the dreams and aspirations of poets and philosophers of past ages and are to-day the admiration of all mankind. In that great struggle the name of David Dixon Porter will ever be associated with those of Lincoln, Grant, Sherman and Farragut, whose friend and companion-in-arms he was, and his deeds as a naval commander rank him with the great captains of all times whose fame illumines the pages of history.

The contemplation of his life is a most fitting subject for the young men assembled here, as the model of what a sea-officer and patriot should strive to be. No romance could be more thrilling than the career of this man: Born of a lineage that had played an active part in every war in which our country had been engaged, he accomplished the difficult task of not only maintaining but surpassing the reputation of his fighting ancestors. His early adventures by flood and field in the Mexican navy, with his illustrious father and gallant cousin, possessed all the romantic charm with which novelists have animated the tales of sea life.

The Porter family was of good old Massachusetts stock. The admiral's great-grandfather was a merchant captain who served in the Colonial wars; his grandfather and great-uncle were bred to the sea and both engaged with credit in he Revolutionary War; the former was commissioned a captain in the state navy of Massa-

[1] An address delivered on the occasion of the unveiling of a memorial window to Admiral David D. Porter, in the U. S. Naval Academy Chapel, on Feb. 21, 1908.

chusetts and commanded the 10-gun ship *Aurora*. Upon one of his cruises he was captured by the British and was confined on board the prison-ship *Jersey*. Effecting his escape he took command of a vessel in the West India trade and resisted a press-gang from a British man-of-war, driving the intruders from his ship with considerable loss. For this spirited conduct he was appointed a sailing master in the Continental Navy.

His son, David Porter, destined to become one of the most distinguished captains in the War of 1812, and father of the future admiral, was born in Boston in 1780. He went to sea with his father at the age of sixteen and was impressed into a British frigate from which he escaped and was subsequently appointed a midshipman in the U. S. Navy, thus commencing that brilliant and adventurous career that marked him as one of the most romantic and heroic figures that adorn the annals of naval history. He served with great bravery under Truxtun in the *Constellation* at the capture of the French frigate *Insurgente*. After the action he was sent with Lieutenant Rodgers and twelve seamen as prize crew of the captured frigate; being separated from the *Constellation* in a gale of wind, these two young officers with their handful of men accomplished the almost unparalleled task of guarding two hundred prisoners and after three sleepless days and nights of superhuman effort succeeded in working their prize safely into port. He performed gallant service in the Tripolitan War and was made prisoner with Bainbridge and the crew of the *Philadelphia*. In the War of 1812, while in command of the frigate *Essex* during her eventful cruise in the Pacific, he won undying fame. Commodore Porter was subsequently appointed commander-in-chief of the Mexican navy, then struggling against Spanish oppression.

David Dixon Porter, the subject of this eulogium, was born in Chester, Penna., in 1813 and at an early age accompanied his father to Mexico and commenced his naval career as a midshipman on board the schooner *Esmeralda*. In the brig *Guerrero*, commanded by his cousin Lieut. David H. Porter, the future admiral received his baptism of fire in one of the most desperate sea-fights ever recorded. This engagement between a 64-gun frigate and a 22-gun brig lasted for an hour and a half, but the skill and valor displayed by Lieutenant Porter and his crew could not prevail against the odds: the *Guerrero* was reduced to a shattered

hulk; even after her flag was hauled down, the Spaniards barbarously continued to fire, and the heroic commander was cut in two by a 24-pound shot. The few survivors with young David were carried prisoners to Havana. He refused parole and remained with his shipmates until events enabled him to return to the United States.

A brief term at school succeeded his return from Mexico and on January 2, 1829 he was appointed a midshipman in the U. S. Navy at the age of sixteen years. His service in this grade was chiefly performed on board vessels of the Mediterranean squadron where his quick and observant mind absorbed such education as the chaplains and instructors in mathematics could impart, supplemented by a few months' study at the so-called naval school at Norfolk where he was prepared for his examination as passed-midshipman. Such was the rough school of experience in which the future admiral learned the lessons of subordination, devotion to duty and self reliance that always characterized his conduct as an officer.

It is the fashion in these days to somewhat under-rate those who have not enjoyed the advantages of regular academic training, but grand halls or learning and sounding literary degrees no more make the great commander than "can storied urn or animated bust, back to its mansion call the fleeting breath."

Porter, like the naval officers of his time, had but few of the privileges of education and training that a liberal government now so generously bestows upon its midshipmen. He was in the best sense of the term a self-made man, a gentleman by birth and breeding first: on this foundation, by study and experience, he built up a strong character and became proficient in every accomplishment that adorns the naval profession. His ardor ever urged him to prepare for great emergencies, and this at a time of much discouragement when our navy was in a state of stagnation and there seemed no hope of promotion. He remained in the grade of lieutenant for over twenty years and during that time was afforded but one brief opportunity for the display of those military qualities with which he was so amply endowed. This was in the Mexican War where he bore a gallant part in the bombardment of Vera Cruz and the capture of the fortifications at Tuspan and Tabasco while executive officer of the little gunboat *Spitfire*.

Well I remember him at the Portsmouth, N. H., Navy Yard in

the years 1859-60. He was then in the prime of manhood, able, energetic and unceasingly occupied in matters pertaining to the improvement of his profession. He had already perfected himself in scientific work by long service in the Coast Survey and at the Naval Observatory and as a captain of ocean steamers early gained the habits of command. Nor was he wanting in lesser accomplishments; he excelled in all manly sports and manly exercises, used the pencil with considerable skill and was master of a clear and forceful style of language. When, therefore, the stress and strain of war time came it found him ready.

It was no accident of birth or influence that placed David Dixon Porter in the fore-front of battle; nor was it fickle Fortune that gave him the highest naval reward that the nation can bestow. Lieutenant Porter's first interview with the President so impressed Mr. Lincoln with his masterly grasp of the situation and force of character that he was given the command of the *Powhatan* for the relief of Fort Pickens and from that time he continued to be one of the most trusted naval advisers of the President. Porter's keen professional instincts saw the overwhelming strategic importance of the possession of New Orleans and the advantages that would follow in gaining control of the Mississippi river. His plan for so doing was laid before the President, who grasped its full significance, and more than once referred to it as "Breaking the back-bone of the Rebellion." At Porter's suggestion the expedition was organized and to him was assigned the preparation of the mortar fleet. Out of the crudest material and under circumstances that would have paralyzed a less energetic and zealous man he created a force that most materially aided the winning of the brilliant victories of New Orleans, Vicksburg and Fort Fisher, victories that rendered the suppression of the Rebellion possible, a fact that is too often lost sight of by the historians of those times. Soon after the completion of Porter's efficient services at New Orleans he was given an independent command. In his subsequent operations on the upper Mississippi, in the Yazoo Delta and on the Red River his deeds find no parallel in the history of maritime warfare, and he is entitled to equal credit with General Grant for the timely capture of Vicksburg. At Fort Fisher he again succeeded in accomplishing some of the most novel and difficult tasks that ever fell to the lot of a naval commander.

To dwell upon his masterly achievements in the Civil War would be a grateful task did time permit on this occasion, to do so would be to epitomize the history of that great conflict. His reputation as a commander has been thus summarized by General Grant: "Among naval officers," said the General, "I have always placed Porter in the highest rank. I believe Porter to be as great an admiral as Lord Nelson. Some of his achievements during the war were wonderful. He was always ready for every emergency and every responsibility." At the close of the war Porter had attained the rank of rear-admiral and enjoyed the proud distinction of having received the repeated thanks of Congress.

In his habits the admiral was very temperate and simple. In private life he was a devoted husband and indulgent father. In social intercourse his manners were free from affectation and his conversation sparkled with shrewd observations on men and things, expressed with a frankness and keen sense of humor that sometimes carried him beyond the bounds of prudence. The generous spirit in which he gave commendation and credit to his subordinates endeared him to all with whom he had official relations. Although not a large man, his presence was dignified and commanding; the impression conveyed by his countenance was that of great power and energy. There was always in his eye a suggestion of good humor, but it was a twinkle that it was never safe to trifle with as those midshipmen found who sometimes thought to get the better of him.

To this still young and vigorous man, pre-eminently gifted with the qualities required for his office, was assigned the administration of the United States Naval Academy in August, 1865. From that time commenced a new era in the history of this institution and much that he planned and organized continues to this day. His hardy indomitable spirit still dwells with us and it is most fitting that this tribute to the memory of David D. Porter should be placed within these walls. It is equally appropriate that this memorial should be contributed by the Class of '69, the one that began and completed the full academic course under his superintendency—"His boys," as he lovingly called us—who remember with pride and affection the great sailor under whom we had the honor to learn our first duties as officers of the navy.

Young gentlemen of the Naval Academy, sentiment may seem

to you old fashioned, and the words of gray-haired men of other times but little worthy of your attention; but I beg you to remember this occasion for it is inspired not alone by sentiment, but by a principle, without which the navy and this academy would be like the body without the soul! May it awaken in you a desire to emulate the bright example of the man who is honored here to-day and so to live that like him you may be worthy of the respect and admiration of the men of a future generation:

> It is splendid to live so grandly
> That long after you are gone
> The things you did are recounted under the sun.

DISCUSSION.

Another "Note on Navigation."

(See No. 123.)

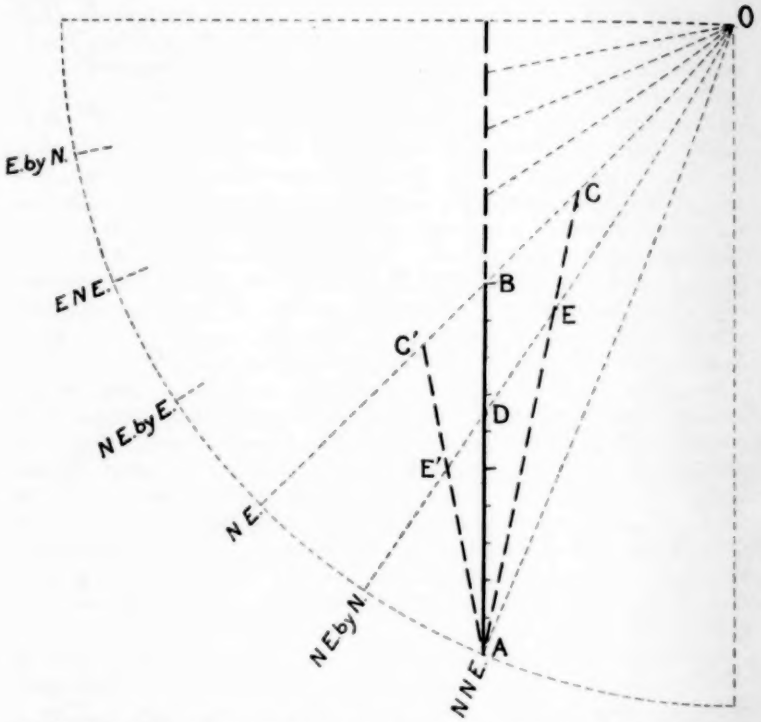
Rear-Admiral C. M. Chester, U. S. Navy.—In the Proceedings of the Naval Institute for September, 1907 (Vol. XXXIII, No. 3), there appears an article under the title "A Note on Navigation," by Commander H. C. Gearing, U. S. N., giving a rule for navigation when there is only one object in sight from which to establish the position of a ship. With all due respect to the marked ability of the author, I must beg leave to differ with him as to the advisability of his Rule of Thumb being "at the ready command of every officer navigating a ship," and I fail to appreciate that there is any discredit to the instructors at Annapolis, owing to the fact that in no instance has he "lighted on an officer thus examined (by a board for promotion of young officers), all graduates of the Naval Academy, who could answer the question" propounded by him. I should as soon have expected these officers to answer "off hand" the result of "one-half the square root of two" on which the answer is based.

For my part I take exception to all such easy methods of navigation that must give only crude results. This applies to that better, but also objectionable, similar problem known as the "Bow and Beam Bearing." My experience even with this, generally, has been to receive a report that one, of the only two bearings taken, is subject to doubt by reason of some object, such as a ship or an island, intervened between the observer and the point observed at the critical moment when the compass should have been read. Thus the correctness of the result is invalidated by a personal equation of greater or less an amount, besides the inherent defects in the problem itself.

The trouble is, the answer to the problem depends not only on insufficient data but that there is no means of checking errors of observation. But let us examine the question itself.

The question which Commander Gearing propounds is: "You are officer of the watch. The ship is steering north. When a point you intend to pass, off which lies a danger, bears NNE. you take the bearing and log readings, and again when it bears NE., the run by log being 10 miles. If you continue on your course, how far off the point will you pass?" I doubt, anyway, if any navigator of a man-of-war will meet, more than once in his practice of a three years' cruise, conditions similar to those implied by the question, and possibly an officer of the watch less often still. Does the danger lie square off the point, may I ask, or is it on a rocky coast with outlying dangers covering a quadrant of the compass? Is the danger a sandy shoal curving as a result of the action of the winds and currents, covering a large area? If either, should not the navigator

know not only the distance he will pass from the point, but also the position of the ship long before she is up with the danger, in order that he may be prepared to steer a course which will insure her safety. How absurd, then, to try to memorize a rule that may never be used in practice. For my own part, if I trusted to my memory and did not understand the principle of the problem, I should be just as apt to multiply the distance run by seven-hundredths as by seven-tenths, and if I did understand the principle, I should be able to devise a rule to fit conditions as they arose.



Referring to the accompanying figure, which is similar to that given by the "Examiner," let us suppose that a 2-knot easterly current is sweeping the vessel in toward the point, as she steers north in accordance with the terms of the question; and where, I ask, is the cape that is not beset with strong and variable tidal action? The ship will not then arrive at the position *B*, as supposed in the question under discussion, but at some point, such as *C*, nearer the danger, and the actual course made good, when extended beyond the second bearing, will show that the ship is likely to bring up on the point, instead of having the margin of safety of 7 miles which is given in the answer to the problem.

As a substitute for the Gearing method, I would like to suggest one that I have used for many years. It is made the basis of the first general

order given by me upon taking command of a ship, and, I may say, I consider it the most important one in the "General Order Book." After impressing upon officers of the watch that they are entirely responsible for all movements of the ship, it reads something like this: "Every officer of the deck will, when coasting, cause to be plotted upon the chart furnished for his use, the bearings of all lighthouses or prominent landmarks in sight at the end of each quarter of an hour, or, when within 10 miles of the coast, for each even point of change of the compass-bearing. The ship's position will be noted on these lines by course and distance between the bearings." Naturally the time of making the observations will be recorded with the observations, so that in either case there will be a uniform measure of either time or angles which will be easy to remember and afford a ready check on the distances.

Now let us compare the results of these two methods in relation to the question before us. The first approximate bearing (if at night) is taken when the lighthouse comes in sight from the masthead. The lookout, then gradually comes down the rigging, keeping the light in view until it is observed from the deck, when a bearing by compass is taken, say, at NNE. The approximate position of the ship is then established on this line by the known visibility of the light. The next bearing is NE. by N., and the distance run, say, 6½ miles on the north course, is read. This gives two positions to mark the track of the ship. If this second position agrees with the position brought forward from the first one plotted, it may be taken as correct. The next bearing will be NE., and the run, say, 3½ miles. We now have three trial positions on the same straight line representing the track of the ship, and the points should check one another. If the 2-knot current has carried the ship to the eastward in the meantime, then she will necessarily reach the line of the NE., bearing later than she would if no current were acting, and the run by log will be 12½ knots when the NE. bearing is reached. If the navigator does not look at his chart, but relies upon the Gearing rule of thumb, he will answer this question by the formula: $12\frac{1}{2} \times 7 = 8\frac{3}{4}$, and will conclude that his margin of safety is ample.

Should he notice that the distance indicated by the log is too much, he will most likely account for it by a current against the ship, for he cannot establish the position until the next bearing is observed. In the meantime his vessel will probably run ashore, and he must content himself, if he can, with the fact that figures will lie in spite of the general verdict to the contrary.

By the graphic method the ship will appear to have made 9¼ miles at the time of reaching the NE. by N. bearing, instead of 6½ miles in the case of no current. Bringing the position forward, as for a Sumner line, the distance will place the ship somewhere on the bearing, say, as at *E*. This simply indicates that a current has taken the ship out of her course, but how much cannot be judged until the next bearing is obtained. Reaching the NE. bearing, the log reads 12½ knots, and, bringing the run forward again in the same way, the track will cut the bearing somewhere as at *C*. Now using a straightedge with the runs of 9¼ and 3¼ miles marked

on it, and manipulating it so that the intermediate point comes on the intermediate line of compass bearing, it will be found that only on a N. by E. course can the distances the ship has run be reconciled with the bearings. The navigator will now find himself making good a course which will pass within 3 miles from the point, instead of 7 miles, and which will probably take the ship directly onto the danger he is trying to avoid. The course should, therefore, be changed to the westward to secure a safe distance from the shore. The next two observations on the NE. by E. and ENE. bearings will furnish two more points, or five in all, on the track which the ship is making; and the track will then be established beyond question, whether the course has been changed or not, or whether it is curved or straight.

Now, taking another case, let us suppose that the log reading on the second and third bearings are 5 and 3¼ knots, respectively. The first will give no clew to the direction of the current, for it may be due to a foreshortening of the distance run by the ship on her supposed north course and not to a change of direction; but the next bearing and run, plotted as before, can only be harmonized with a line drawn in a N. by W. direction, and the last position established shows a southwesterly current which must be allowed for.

But whatever the readings of the log may be, the navigator may, by noting the ratio of the distances run between the successive lines of bearing (checked of course by the elapsed time) determine his course made good after three bearings have been obtained, with much more certainty than by the Gearing method, or by bow and beam bearings; and when five bearings have been observed the course of the ship will be established beyond question. Thus the figure shows that, if the ratio $\frac{EC}{AE}$ is less than the ratio $\frac{DB}{AD}$ the vessel is carried inwards toward the point from which the lines of bearing radiate; and, also that, as in the case of the line AC', if the ratio $\frac{E'C'}{AE'}$ is greater than the ratio $\frac{DB}{AD}$ the vessel is being carried outward from the course steered and not inward toward the point from which the lines of bearing radiate. If the ratios are the same as $\frac{DB}{AB}$ the ship will be making good her course, but the current may be operating to retard or increase her relative rate of speed. Suppose, for instance, that the total distance run to the NE. bearing be 13 knots, but the distances between bearings to be 7¾ and 4¼ knots respectively. Now by measuring off and marking these points on the straightedge, and superposing the middle point over the middle bearing (whether using three or five lines) it will be found that the end marks lap over their respective bearings on the north course by amounts proportionate to the distances logged.

Now reducing the length of the runs on the straight edge by the amounts in excess of those given by the bearings on the north course the distances will show that, while going through the water at the rate of 13 knots, the ship has actually covered a space over the ground of 10 knots only. She

will, therefore, have been set back 3 knots by a current against her and has only reached the point *B* instead of a position 3 miles further on.

While the course made good is thus clearly established, if the ship is kept heading in the same direction, the positions are subject to some doubt unless we know the rate of current. If, for instance, we assume no current with the same runs of 9¼ and 3¼ miles, the course may be plotted on a line to the westward parallel to and distant from the supposed course by about 2 miles. And in the same way a similar line may follow to the eastward, if the current run in the opposite direction. It may be taken for granted, however, that a navigator who has studied his records of currents and tide tables (which by the way ought to receive just as much attention when coasting as when navigating a river near the coast) will have gained sufficient knowledge of the general trend of the stream, as will, with the numerous bearings taken, enable him to approximate his position quite near enough to avoid danger; but a change of course will bring about such a disproportion in the distances as to be seen at once, checking the errors and establishing the points.

I would like to say for the benefit of young navigators with reference to the practice of sighting a lighthouse from aloft and bringing it down to the deck, that it has saved my ship from accident more than once. As it frequently happens on our coast, there is a light haze overhanging the land, not noticeable from the sea, that partially hides all but the red rays of the flame, which, as is well known, have more penetrating power than the other rays. In such cases the light will probably be sighted from the masthead and the deck at the same time in spite of the difference in altitude. This generally indicates that the ship is inside the ordinary limits of the visibility of the light and precautions should be taken to guard against an error of position due to this fact. During my experience, I have at times seen nearly every white light on the Atlantic coast giving forth red rays only, and they were invariably reported as red lights by the lookouts. This cause has stranded more than one vessel in our own navy.

Scientific navigators, such as naval officers are supposed to be, must work on scientific principles, and not with methods so crude that none requiring more refinement than a fisherman may safely adopt them. In the case in point, the question should be not where will the ship be at some future time, but what is her location, as near as possible, at the moment, whence to shape a course which will avoid all dangers whatever bearing they may take from the point to be passed.

In criticising Commander Gearing's article, my only object has been to impress upon the officers of the service that they should not make light work of navigation, but endeavor to raise it up to a plane commensurate with the great interests at stake in the navy. If he is to be successful, the navigator will find use for every moment of his time at sea, since it is only by continued practice that he can acquire the knowledge and skill to enable him to meet the demands which fall upon him in time of war when many of the artificial aids to navigation have been destroyed in order to lead him into trouble. No more important duty exists in the navy than that committed to his charge; and, with all due respect to the "man behind the

gun," his work is not to be compared with that of the man who has to bring the ship into battle quickly and safely. The sooner this is recognized by the young officer and the subject of navigation is taken up by him, in accordance with the highest scientific practice, the sooner he will become what he was intended to be when he began his education at the Naval Academy—a scientific navigator.

NOTE.—It should be understood that the measurements noted herein by the graphic method, are taken, as they would be in actual practice, from the charts where all the work is shown. Those officers who do not want to mark up charts can use tracing paper over them.

The eye and the dividers (proportional if necessary) will naturally take the place of a straightedge after a little experience has been had with the problem.

Some Hints to the Study of Naval Tactics.

(See No. 125.)

Rear-Admiral C. F. GOODRICH, U. S. Navy.—The prize essay for this year is of much interest, and I have read it with great pleasure. With its statement of what the author is pleased to call "laws" I am in entire accord for I think that the principles which he lays down are eminently correct. I must, however, enter my protest against his proposition to perform any one evolution in several ways. If sufficient time were devoted to drilling our ships and squadrons, it is barely possible that an alternate method might be considered available, but it is an open secret that they devote only a few hours, or days at the most, each year, to this important subject and it is futile to conceive that in so brief a period they can acquire proficiency even in one method, let alone three. For that reason I am unalterably opposed to the so-called direct movements, which, by the way, should be more appropriately called oblique movements. Since they involve a change in course and a change of speed in pretty nearly every vessel of the fleet, they produce a temporary confusion requiring many minutes to correct. I grant the theoretical advantages in some cases of the "special method" but the criticisms directed against oblique movements are still more applicable to the special movements. I hope that our ships will shortly be forbidden to move except rectangularly.

In discussing the first evolution Lieutenant Pye mentions, namely: from line into column, it may be observed that the interference with gun fire is, or ought to be, of small consequence, for it is not likely that such a movement would be made in the presence of an enemy. Even if so made, there can be no question that the method should be adopted which will cause the least disorder, and that method is the rectangular beyond all peradventure. In addition it occasions almost the least interference with gun practice.

In discussing the change from column to column at right angles, I cannot understand why, in the rectangular method, he makes a ship go right about first and then column left, thus inverting the order. If distance to

the front is to be gained, the rectangular method would prescribe column right, a movement which he labels "direct." If distance to the rear is to be gained, then his so-called rectangular movement is applicable. I do not see why he should not give column right and be done with it.

In the third case cited—being in column to form line of bearing two points from course, it is pertinent to remark that the times allowed to the special and direct methods are purely imaginary. After approaching a new formation through these methods, quite as much time as that specified for the maneuver itself would be spent in steadying down to regular speed. Here, again, the so-called rectangular is infinitely better because, when the evolution is completed, the ships are in proper places and going at proper speed.

The supposititious battle is very interesting and instructive. I think that the principal lesson to be drawn from it is the imperative necessity of frequent practice on the game board with tactical situations. Other things being equal, a commander-in-chief who has won and lost a great many such games will be in a better position to grasp the features at each stage of the battle than one whose training has only been theoretical.

The interest in naval tactics evidenced by this most readable article is full of good omen for the Naval Service. May others bring their candles too, that the subject be flooded with light.

Money for the Navy.

(See No. 125.)

Rear-Admiral C. F. GOODRICH, U. S. Navy.—It is quite unprecedented that an essay, written in competition for the Institute prize and bearing a title strongly suggestive of what the captious have been accustomed to call the "Dismal Science" should be interesting and amusing to an incredible degree. As a matter of fact, I read aloud this especially valuable contribution to a circle of friends, whose hilarity, in places, they were totally unable to restrain. I cannot blame them for being moved to laughter by some of the illustrations of navy yard methods, yet, personally, while recognizing the humorous side, I felt, at times, more inclined to tears than mirth.

This exposition sets down its statements in definite and unmistakable language, and carefully supports them by references to undoubted authority. The facts themselves, in a general way, have been known to every member of the naval service for many years. I am extremely sorry that it should be necessary to paint the picture in such unpleasing colors, yet I am convinced that, in the long run, it is a wise policy to tell the truth as it exists, in order that a better state of affairs may be brought about. Should this result from the publication of Pay-Inspector Mudd's essay "Money for the Navy," the author will be entitled to the sincere gratitude of the sea-going branch of the navy, as well as of those who deal exclusively with service matters on shore.

I am not familiar with the exact form which an appropriation bill should take, but his suggestions certainly bear the evidence of reason and good sense. It would seem as if Congress could better study and digest such

an appropriation bill as he proposes, arranged methodically under several well considered and easily comprehended heads, than an indiscriminate collection of miscellaneous items as is the present case.

And much of this essay concerns me very nearly, because, since in command of the New York Yard, I have made an important experiment in official correspondence which yielded excellent fruit. I had little difficulty in demonstrating to the Department the advantages of more direct communication, which it has definitely adopted.

My attention was first drawn to the circumlocutory method prescribed by previous regulations through receiving a letter from the Naval Constructor gravely informing me that steam launch No. 7742—say,—was ready to receive her wheel ropes at the hands of the Equipment department. When I asked why under heavens the Naval Constructor did not inform the Equipment Officer to that effect, and why he should write to me about a matter which did not interest me in the slightest, I was informed that such a procedure on his part would be wholly irregular and contrary, not only to the regulations of the yard, but to the regulations of the Navy. Nowadays the Naval Constructor calls the Equipment Officer up by telephone and tells him the condition of the launch, and the Commandant's office is not bothered with useless papers. Again, about the same time, I received a solemn document from the General Storekeeper asking me, for example, whether 500 gross of iron screws for the U. S. S. *Hackmatack* should be machine screws or wood screws, and of what sized wire should they be made. Here, again, I replied that I did not know and did not care, and why didn't he ask somebody on board the *Hackmatack,* receiving the same answer that such a letter was highly improper and against the regulations. To-day the General Storekeeper writes to the *Hackmatack,* no matter whether she is in New York or Havana, asks the question and gets a direct reply without loss of time.

In consequence, where formerly I had to write my name many hundred of times a day, I now sign only such papers about forty in all as require decided action on my part.

Having less to do in the office, I have had more leisure to devote to the study of yard matters in general. I have long held that the multiplicity of shops was contrary to good practice, efficiency, and sound economy. In December last, I submitted to the Department a definite recommendation that certain shops be consolidated. This recommendation received not only the approval of the Navy Department but its most cordial support. I was authorized to consolidate these shops. To-day the Department desires this consolidation to be extended to others as rapidly as practicable, with the view of eventually having this yard fairly comparable in simplicity of organization and efficiency of operation with any other industrial establishment on the Atlantic Coast.

Pay-Inspector Mudd's article reaches me opportunely, supplying me with extremely valuable facts and inferences and with some suggestions of which I shall not hesitate to avail myself in carrying on the important work with which the Department has charged me.

I have always held that there should be a system of inspection of our

navy yards. The practice, which has been found so successful, of inspecting the accounts of pay officers, should be adopted and expanded so as to include all the workings of the shore plant. I give myself the pleasure of heartily emphasizing these words of the essay—"This navy yard expense is one of the most important items in the Navy's unfinished portfolio. The amount involved is enormous, and the duty in regard to it is clear. It is the writer's opinion that the 'costs' can be kept down to near the necessity point only by constant inspection from the outside, combined with enforced competition between the yards, in doing similar work."

I shall be glad if Mr. Mudd will elaborate this idea and present it in working shape, definitely recommending the persons to make the inspection and the way in which the inspection shall be carried out, assuring him that at no yard will their visits be more welcome that at my own.

We all know that there are too many navy yards; that but a few are really necessary on each coast and that the others should not only be closed up but the ground upon which they stand sold or otherwise ceded, so that on no pretext can they ever be opened again. The work of the Navy can be much more rapidly and efficiently carried on if concentrated in a few yards, as Mr. Mudd so effectively advocates.

I have been careful not to inquire too closely into the red, blue, and green yards of his story, but the result is very clear that one of them ought to be closed up without delay.

Passing from the general to the specific, I agree with him perfectly that there should be the keenest possible competition between the different yards, and that when the cost of some articles differs widely, as in the instance he quotes, there should be an inquiry from the Department, and, possibly, the yard materially at fault directed to cease all work of that nature.

I am not at all sure that each yard should not have its own specialty, and that as a rule all boats should be built at one place and all ditty boxes at another, etc. I know the objection to this would be that boats and ditty boxes must be repaired, and unless you have at every working yard men competent to do this, repairs cannot be effected rapidly and economically. It would seem then to be a question whether the freight for shipping boats for repairs to the boat yard would cost more than the money saved through the economical and efficient work of the central boat yard. I do not attempt to solve this particular problem, I only point out the many sided nature of the question and that it leads to numberless others.

The Old Bronze Guns.

(See No. 121.)

Lieut.-Commander E. L. BEACH, U. S. Navy.—The publication in the PROCEEDINGS OF THE INSTITUTE of the article on "The Old French Bronze Guns" has awakened quite an interest. As I suspected, these cannon, all with the motto, "Ultima ratio regum," are to be found widely distributed. In the early days of the nineteenth century, Salem, Massachusetts, was a regular market for them, and no whaler left Salem or New Bedford for the South Sea Islands without several on board. These guns are still

to be found in different parts of the United States, from New York to California. A number of bronze guns, sent from Cuba to this country after the Spanish war, were of old French manufacture, with the familiar motto. My efforts to trace their origin in this country have been fruitless, but their numbers are so large that the conclusion is inevitable that they were captured from the French in the old colonial wars.

The following is part of a letter from Mr. Wm. Churchill, formerly United States Consul-General at Samoa. Mr. Churchill is a veritable son of the South Seas, having spent many years in the Pacific, studying various Polynesian languages. This caused him to visit hundreds of islands, and in these he has seen more than a thousand old French bronze guns, left there years ago by American whalers:

"More gun stuff, but like my former communications on the subject more Pacific in application than Annapolis, yet I do not hesitate to send it to you.

"Moerenhout: 'Voyages aux Iles du Grand Ocean,' translated in 13 papers, Haw. Hist. Soc. 32. After detailing the acts of South Sea piracy of the Chilean national brig *Araucano*, 18, in 1822, when in the possession of mutineers, her capture by Captain Henry in a 40-ton brig out of Tahiti, the futile wait at Tahiti for Admiral Cochrane to reclaim his vessel, Moerenhout concludes as follows: 'Some years later the natives destroyed it appropriated the cannons, which are yet on an islet in the center of the harbor Papeete on the northwest side of the island.'

"Eighth Ann. Rept. Haw. Hist. Soc., 21. Dr. N. B. Emerson: 'History of the Honolulu Fort.' 'Peculiar interest attaches to the fate of a long brass cannon which lay unmounted on the parapet not far from the fort's western angle. It was probably of Spanish manufacture, and imagination is invited to adorn its history previous to its arrival at Honolulu with any account of romance. Age and contact with the world had imparted to it that delicious bronzy tint suggestive of rich wine or a peachy Castilian cheek. Besides other adornments it bore in relief the Latin motto, "Ultima ratio regum" (the last argument of kings). When the Frenchman[1] came to this work of art he first tried to cut off its trunnions by chiseling a furrow about their base and then smiting heavy blows with a sledge hammer. But this attempt at mutilation failed, and the story is told that the final blow given by the Frenchman missed its aim and smashed the man's foot. After the departure of the invaders an attempt was made to remove the steel with which its touch-hole had been spiked. During that operation the workman sat astride of the gun, and by some chance a heavy charge of powder which the Frenchman had put into its chamber was fired. The spike was driven up through the man's head, but strange to relate, did not cause his death. The gun was pointed across the harbor at the time and the shot and scraps of iron with which it had been filled in their flight struck a man aboard a vessel lying near the present

[1] WC.—In August, 1849, Admiral de Tromelin, commanding a French squadron consisting of the frigate *Poursuivante* and the corvette *Gassendi*, landed in force and took the fort.

site of the wharf of the Oahu Railroad and Land Company, causing his death.'

"Papers Haw. Hist. Soc., 5. Warren Goodale: 'Honolulu in 1853.'

"'Around on the walls were ships' cannon of various calibres. At the foot of the flagstaff was a large 32-pounder of Spanish or Austrian casting, for which it was said the government (of Hawaii) had paid $10,000. There was a coat of arms in high relief and of fine workmanship. Just before the trunnions and behind this on a scroll in raised letters was the name of the piece of "La Regina," and on another scroll on the re-enforce was the motto, "Ultima ratio regum."'

"(Page 7) 'The composition gun "La Regina" resisted all their efforts to break the trunnions, even after procuring cold chisels with which they made deep cuts, so they rammed it full of grass, gravel, and stones, boarded their boats and left. The brass cannon was afterward sold for $600 and sent to the New York Bell Foundry.'

"This last note is a fingerboard to a new line of inquiry. There is one bell foundry which has been in the same family since the Revolution, the Meneely foundry, at Troy, N. Y. Now if a gun was worth $600 to a New York foundry when it lay half around the world, you can see that a brisk trade must have been done at home. Probably the ancient books of account of the Meneelys, say between 1780 and 1820, would afford interesting data as to the source of the bronze pieces which they bought. Those old guns were splendid bell metal, for all that was needed was to add the silver in the foundry. I recall now a mental memorandum from a wise bell founder that a maiden gun was never so good a bell as one that had been often fired and had developed the resonant tone. I cannot imagine how resonance would last through a second melting, but I put down the note as I recall it from my grab bag of a brain which has always been tenacious of all sorts of oddments of no earthly value whatever. You will do well to follow up this line."

Aids to Contentment.

(See No. 124.)

Ensign PAUL P. BLACKBURN, U. S. Navy.—In the discussion of ways and means to increase the contentment of the enlisted personel of the navy there seems to have been one thing which the various contributors to the NAVAL INSTITUTE have forgotten. It may be a little thing perhaps, but it is a fertile source of discontent among the officers as well as among the enlisted men.

The people on a ship are the last ones to know where the ship is going and when. From the service periodicals we can sometimes gain semi-official information as to the plans for this or that squadron. Our only other source of information is the "galley rumor."

In times of peace there must be a well formulated plan which will cover the movements of, at least, the battleships and cruisers of the navy for the ensuing six months. Of course everybody realizes that emergen-

cies arise necessitating deviations from this program and men in the service expect sudden calls when the occasion requires. Why cannot the Navy Department issue to the commanding officers of each ship "for the information of the officers and crew" a *tentative itinerary?* This need not give the exact dates of arrival at and departure from the various ports, but should be so made out as to give to those most interested—the men who have to go—some definite idea of where they are to be sent and when.

Emergencies must arise which will disarrange these tentative itineraries. They should give the plans for the ship providing conditions permit. Sealed orders are sometimes necessary—though there have been times when the newspapers published the destination of a ship sailing under sealed orders on the day the ship sailed—but such occasions are not intended to apply. It is the ordinary cruising in the time of peace, when the ship moves in accordance with a previously determined plan. The officers and crew could be notified through the commanding officer when the published itinerary would be changed materially.

Would not a removal in this way of one of the most annoying features of naval life—the utter uncertainty as to future movements—conduce to greater contentment on our ships?

Commander T. W. KINKAID, U. S. Navy.—In my opinion the service is to be congratulated upon the fact that an officer of Admiral Goodrich's rank and ability has seen fit to take up the important subject of "Aids to Contentment in the Navy." If our service is to reach the highest possible state of efficiency, we must have a large percentage of re-enlistments. These we shall never get unless some way be found of making the career of the enlisted men attractive. Admiral Goodrich's idea of creating a naval station on Staten Island and utilizing the adjacent waters for rendezvous and drill would, if carried out, not only make for increased all-around efficiency of men and material, but would give to both officers and men some assurance of not being always homeless wanderers.

If Admiral Goodrich would modify his plan for sea drills so as to require only three days of the week for such purpose, there would be left two of the five working days for necessary overhauling of propelling and turret machinery and other mechanical appliances, and for the necessary coaling and cleaning of the ship, besides such infantry and other drills as might best be undertaken in port. I believe that even three days of steaming in each week would tax the coal appropriation pretty severely.

Lieut.-Commanders Plunkett, Hoff, and McLean have made many valuable suggestions; and, if the officers throughout the service will not only study the subject, but will discuss it as much as possible, a great deal will ultimately be accomplished.

Lieut.-Commander Hoff places the *food* question at the head of his list. Very likely he is right; but next in order, I think, should come the question of uniform. Many officers, I am aware, do not think so. In fact, I know that a large number think that the present uniform is "all right," or at least "good enough." But the *men* are not satisfied with their uni-

form; and their feelings in this matter ought to receive very serious consideration. The underclothing of the enlisted force has been improved from time to time, and now it is very good indeed. If I am not mistaken, both officers and men are very well satisfied with it. But the outer clothing, or at least the blue uniform, has not been improved at all.

The blue flat cap is the most faulty part of the uniform. It is easily knocked off or blown off the head; and it is an unsanitary affair at best. I would give Jack a cap similar in model to the one now worn by chief petty officers, making such change in the device as might seem proper. The chief petty officers could be given a cap with higher and broader crown and longer vizor.

The blue shirt should be precisely like the one now issued to chief petty officers. The cravat should be the well known "Windsor" tie.

I would also provide a coat, single breasted, and a trifle shorter than the one worn by C. P. O.'s. The coat would be worn chiefly when on liberty and on dress occasions.

The trousers should be of the same pattern as those worn by marines, though somewhat fuller. They should be supported by a black unglazed leather belt, with bronze buckle.

Having our enlisted men well fed and well clothed, there would remain at least one other principal item necessary to bring contentment, and that is—shore duty. I have long believed that to induce good men to remain in the service it would be necessary to give them a break in the monotony of their sea life by granting a reasonable period on shore at the end of each cruise.

Suppose that we adopt the principle of giving each enlisted man alternate periods of three years at sea and one year on shore, the latter at some naval station. Does any one doubt that such a shore force could be usefully employed? What with shore drills, rifle practice, work in magazines, sail lofts, machine shops, and on board ships in ordinary and ships out of commission, I think Jack-on-shore would be a busy man.

When all the good things mentioned by our various writers have come to pass—improvement of liberty and drill regulations, improvement of food and food service, improvement of uniform, home port for each ship, and shore duty at end of cruise, possibly we shall see delegations of shore employers protesting to Congress that all of their best men leave them to go into the navy!

P. Asst.-Paymaster O. H. KING, U. S. Navy.—From time to time various discussions leading to the improvement of the general conditions surrounding the enlisted personnel of the navy, have appeared in the INSTITUTE, and in other manners have been brought to the attention of the thinking and reflecting officers of the service. Little by little the various paymasters-general of the navy have built up the commissary system, and aided thoroughly by the executive branch of the service, have succeeded in making this former point of criticism one which can to-day be successfully eliminated from consideration when "What's the matter with the navy?" is threshed out.

The pay question has been from time to time considered, with the result of many beneficial actions on the part of the Commander-in-Chief of the army and navy. There is reason to believe that there will not be any retrogression along these lines, and that gradually a scale of pay commensurate with the services rendered, as compared with the remuneration given in civil life, will be successfully established.

There are consequently removed from discussion, except in a limited and specific sense, two great points which might tend to discontent in the enlisted personnel.

The great point on which there would appear to be a possibility for the discontent which exists to a certain percentage, is that of punishment for offenses. There have been various means of solving this question advanced by many officers of wide and varied experience on this subject. Before discussing the naval judicial code, it is well to consider the psychological side of the question. It is asserted, and I think correctly, that fully 90 per cent of military offenses are committed within the first six months of enlistment. Of these, in turn, it is my experience that fully 75 per cent are desertion and absence without leave.

The recruit, who has taken the oath of allegiance to the United States, in but few cases realizes the solemnity of his oath. He has been accustomed, either in his own experience or that of other male working members of his family, to the universal habit of leaving the service of an employer should the whim so take him. It is, to him, a part of his heritage as a free-born American citizen, that it is entirely within his province to decide whether or not he is to work for a certain man or corporation. It is impossible, in civil life, for an employer to form a covenant with an employee as arbitrary and as binding as that covenant made by a man enlisted in the military service of the United States. Such a contract would be utterly illegal under the civil code.

Again, the man who has enlisted, is frequently placed in the position where, for certain military reasons, he is denied shore liberty. This to him is again liable to seem an infringement of his constitutional rights. Unless he is actually on watch or on duty, it seems to him to be a needless and a harsh restriction that he must stay on board ship, while the lights of a big city shine, with their temptations for amusement and gaiety, as compared with the necessarily restricted hours on board ship. Were he at work in civil life, he might have to appear at an office or shop at hours ranging from six to eight in the morning; his hours might last until five or six in the afternoon; but the hours between twilight and dawn are certainly his to do with as he will.

Lieut.-Commander A. B. Hoff very ably pointed out in Number 124 of the INSTITUTE a proposed specified probationary period of six months, at the conclusion of which regular service might begin. On paper this plan would seem excellent, and in practice there would be many things to commend it if—and here we reach the eternal if—the men who enlisted for the "trial marriage" period of service went into it seriously with a direct idea of really finding out whether or not they were fitted for the service, and whether the service agreed with them. This would be capable, also,

of producing entirely different results on entirely different ships. Two recruits enlisted on the same day at the same town, with their temperaments as identical as is possible in the tangled scheme of things, might be so sent to sea that at the conclusion of six months one would be enthusiastic about the service, and the other ready to quit. For example, a long stay off a Central American town on a small gunboat, continually rolling to the long swell, with no liberty allowed on account of yellow fever, or other climatic or sanitary conditions, would soon take the enthusiasm out of the brightest and most optimistic recruit.

As it stands there are many men in the navy to-day who stayed through their first year in the service only because they regarded their oath as binding. After the first period of *heimweh* had passed away; after they, as every man in the service must do, had readjusted their mental attitudes so as to regard many restrictions and deprivations which at first seemed Titanic as merely matters incident to the routine, then there began the building up of that finer spirit in which the service became to them an animate thing, something to call forth a certain affection without which no body of men can accomplish the great things of the world. Were there a probationary period, many such men might be lost to the service.

The writer has had almost three years of more or less intimate connection with naval prisons. It is from these premises that he is able to speak feelingly, believing sincerely that almost fifty per cent of the men who are discharged from the service with dishonorable discharges could have been saved to make valuable and efficient men for the service; not only in the one enlistment, but in subsequent ones.

I would presume to suggest a revision of the code of punishment for general courtsmartial. It is believed, if the penalty for desertion was changed, on the first offense, in the discretion of the commanding officer, to a maximum of six months extra duty aboard the ship on which the man was serving at time of desertion, with a maximum loss of pay not more than fifty per cent of the amount per month during that period, that a better code would be arrived at.

Further, a most important feature is that, during such a period of punishment the man would be a continual object lesson to his shipmates. Under the present system, he is probably not even tried on the vessel from which he deserts, but on the receiving ship on which he was delivered or surrenders himself. He is then sent to a naval prison or prison ship, where he is fed as well as on a sea going ship, has comparatively light work to do, and with the exception of not obtaining shore leave, is as well off as his late messmates. In fact, one man, a general court-martial prisoner, with whom I was speaking one day, said: "I'd much rather be here than on a little spit kit off Colon; I don't get liberty here, but I didn't get it there, either.'

Under this proposed system of punishment, the care of the ships' heads, the cleaning of bilges, of the ship's sides, and other necessary sanitary and cleanly work could be placed entirely in the hands of the "extra duty" men aboard ship, thus relieving the steady and well-behaved members of the crew from these unpleasant and really unmilitary duties.

In extending a so lenient punishment for a first offense in the case of absence without leave or desertion, there would necessarily follow an increased severity in punishment for a repetition of the offense. For a second offense of desertion, I would recommend a minimum *punishment* of two years at hard labor, preferably in a state's prison, where the food is by no means as excellent as that of the regular navy ration, and where the work is actually hard labor. A second offense of absence without leave might have such mitigating circumstances as to make it hard to make a definite fixed minimum of punishment. That, I think, should be left to the commanding officer. However, a third offense of this kind should be treated in the same manner as that of a second offense in the case of desertion.

Such crimes as would be punishable under the civil code should at all times, in my opinion, carry with them confinement in a state's prison, at actual hard labor, on prison fare.

Further, ceremonies which are impressive in detail are ones which fix themselves upon the minds of even the most highly educated persons, it is believed that when a man is sent from a sea-going ship to be punished by imprisonment, a highly impressive ceremony should be made of it. A friend of mine who was present at the time Captain Dreyfuss was broken from the French Army said that he had never seen so horribly impressive a ceremony. This witness, a naturally phlegmatic man, said the scene made him almost hysterical. To this end, I would advocate that when a man has been convicted aboard ship of an offense carrying with it imprisonment, the ship's company be formed, as it now does when the sentence of the court is read, and that, there, before the company, the rating badge—if any—watch-mark, and all insignia of the naval service be removed from the man's garments by the master-at-arms.

Should the above recommendations ever be put in force, they would carry with them the abolition of all naval prisons and prison ships. This in itself might be criticized by many persons, but it is believed that from an economic standpoint alone the abolition would be entirely justified. The undersigned is unable to obtain the figures of the expense of maintenance of any of the naval prison establishments except the U. S. S. *Southery*, receiving ship for prisoners at the navy yard, Portsmouth, N. H. From the paymaster-general's annual report for the year ending June 30, 1907, the total cost of the maintenance of the *Southery* is given as $209,476.28, this being practically the cost of maintenance of the *Des Moines*, an efficient ship of the secondary line.

It is further believed that the application of a system of punishment for minor offenses aboard ship might be adopted with some degree of success. In many cases, the commanding officer, whose time is filled with the manifold details incident to his duty, has little or no personal knowledge of the men brought to the mast for punishment. Particularly is this so aboard a modern battleship or armored cruiser. It is believed that some such a system as the following might prove to be very satisfactory:

Make each divisional officer and head of ship's department the judicial officer for those men who perform their daily work under his supervision

and control. Maintain "mast" as at present, with the commanding officer present. When the complaints are made, let the divisional or department officer make the investigation in the presence of the commanding officer. Should that officer desire to ask any questions he could easily mention them to the divisional officer. After the complaint has been made, and rebuttal, if any, offered, let the divisional officer suggest to the commanding officer what punishment, if any, should be awarded, together with a statement of any circumstances which might bear upon the case, as the man's excellent or poor conduct in the work of the division or department. This might be objected to on the ground that it shears the commanding officer of a certain authority. On the contrary, it does not. The captain is, also, the surgeon, the paymaster, the engineer officer, and the head of each division. Those officers when performing that duty, to a large degree, are merely his representatives. They would not cease to be so in investigating offenses and awarding punishments. Further, in any case, the commanding officer would have the right to approve or disapprove any punishment. It seems to me that this would tend largely to develop the inter-group system to its highest point of efficiency. Many an officer, line and staff, has seen men, who have been under his charge under ordinary conditions, punished for offenses when he felt the punishment was excessive and unmerited. In my personal experience I have served with a commanding officer who, whenever a man in a staff department was on the report, sent for the officer in charge of the department and talked the matter over with him before the case was brought to the mast. In almost every case he practically took the view of the head of department. These officers, in turn, took the highest pains and pride in maintaining a splendid state of discipline in their departments, and the men, feeling that their immediate superior was, in a way, responsible for their actions at all times, showed a splendid state of loyalty.

In re Amalgamation, Line and Engineers.

Commander J. F. LUBY, U. S. Navy.—While in charge of a towing trip recently—the *Machias* towed by the *Hannibal* from Pensacola to New York—I ran across a case of what might be called natural amalgamation. The temporary crew sent from Norfolk by the Bureau of Navigation to serve on the *Machias* during the passage north was composed of eleven engineer's force and nine of the seamen's branch. This may seem odd, as the vessel had absolutely no motive power except a few leg-of-mutton sails, trysails, and staysails; but I suppose they were the only men available, and they answered very well.

Among these men was a chief machinist's mate, P———, whom I noticed engaged in all sorts of sailorizing work. (There really was no other work to do.) Bye and bye my curiosity was aroused, and I asked him if he was not a chief machinist's mate, to which he replied, "Yes." I said, "Where did you learn to be so good a sailor?" "Oh," he replied, "I was donkey-man on a deep-water ship for a couple of voyages." I

fancy the mate of the deep-water ship did not allow the keeper of the donkey to be idle during the long periods that doubtless the donkey rested; hence P——— learned to be a sailor as well as a machinist. He could steer, read the instruments, mark a log-line, and stood a deck watch on our passage, recording winds, courses, etc., and thus showing his knowledge of the compass and barometer.

Now, what is the matter with amalgamation, when it can be so easily accomplished in the merchant service?

PROFESSIONAL NOTES.

Prepared by Professor PHILIP R. ALGER, U. S. Navy.

SHIPS OF WAR, BUDGETS, AND PERSONNEL.

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Ersatz Tegethoff	14,500	Trieste.	Building.
Ersatz Kr.-Rudolf	14,500	"	"
Ersatz Kr.-Stephanie	14,500	"	"
Scout.			
Ersatz Zara	3,500	"	Projected.

NEW BATTLESHIPS.—From accounts of the new 14,500-ton battleships now building for the Austro-Hungarian Navy at the Stabilimento Tecnico of Trieste, it appears that the new vessels will be 131 meters in length by 25 meters beam, and their engines will develop 20,000 horsepower. They will be armed with four guns of 30.5 centimeter caliber, eight 24-centimeter, and twenty 10-centimeter quick-firers. One of the fruits of the lessons of the Russo-Japanese war is an arrangement by which the equilibrium of the vessel is preserved whenever an explosion or a collision fills a watertight compartment. The corresponding compartment on the other side of the vessel is arranged so as to fill simultaneously, and, though the vessel is thereby brought lower into the water, it is saved from heeling over and exposing vulnerable parts to the enemy's fire. Two rudders are also fitted to the new ships, and in the ammunition magazine cooling apparatus is installed to prevent the temperature from ever rising above 76° Fahr.—*Army and Navy Gazette.*

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Vérité	14,865	Bordeaux.	Under trial.
Liberté	14,865	St. Nazaire.	" "
Danton	18,350	Brest.	Building.
Mirabeau	18,350	Lorient.	"
Voltaire	18,350	Bordeaux.	"
Diderot	18,350	St. Nazaire.	"
Condorcet	18,350	"	"
Vergniaud	18,350	La Seyne.	"
Armored Cruisers.			
Ernest Rénan	13,644	St. Nazaire.	Launched April 9, 1906.
Jules Michelet	12,550	Lorient.	" Aug. 31, 1905.
Edgard Quinet	13,644	Brest.	" Sept. 21, 1907.
Waldeck-Rousseau	13,644	Lorient.	" Mar. 4, 1908.

Le Yacht states that the French battleship *Vérité* has made her full-power trials at Douarnenez with complete success. In a run of 10 hours at maximum power the Belleville boilers developed 20,433 horsepower, being 2433 in excess of the contract, with a consumption per horsepower and per hour of 817 grammes. The speed was 19.26 knots, being 1.26 more than the contract. The machinery worked with perfect ease.

M. Chaumet, who has charge of the preparation of the French Naval Budget, has recently laid his report on the table of the French Chamber. An abstract of this report is given in *Le Moniteur de la Flotte*, from which we take the following: "The relations between the different countries are of too variable a nature to make it possible to constitute a fleet with a view to fight any particular eventual enemy. Torpedo-boats and submarines are required because of their military value, and not by reason of a so-called economy, seeing that their construction and armament are proportionately more costly than those of larger units. . . . . After the construction of a ship has been decided, it should be possible to give to the naval arsenal, within six months at most, all the required data to allow the latter to place the contracts for all material and machinery. . . . . M. Chaumet does not propose that the Government yards should be done away with, for, besides their military character, they should also play a part in the question of economics. They are, however, far from exercising such a beneficial action, for they are too numerous, badly equipped, and badly organized. They should, to say the least, be specialized, and the heavy battleships be built at Brest and Lorient, the smaller craft being built and kept up at Rochefort and Cherbourg. Toulon forming the repairing-yard for the maintenance of the Mediterranean squadron. Bizerta might be set apart also for the latter squadron. . . . . French naval artillery does not appear to be inferior to the British. In the case of the 12-inch caliber the muzzle velocity of the French guns has always been higher than that of the British guns. But the French guns, on the other hand, are less satisfactory in the matter of rapid firing, this being due mainly to defective installations on board the French ships, and these defective installations are a consequence of red tapeism, which entrusts several departments with the organization of work in which unity of views and co-ordination of efforts should form an indispensable factor. . . . . The conditions for the testing of projectiles have been rendered more stringent. New systems of priming are being devised. For firing in times of peace, and for the sake of economy, cast-iron projectiles are maintained in use. For use in war-time steel projectiles will be resorted to exclusively. It has been decided at last to unify the projectiles, and to replace the armor-piercing and semi-armor piercing by one single type, much heavier than the former types, and which, besides having a higher perforating power, will carry a greater explosive charge. A projectile with a high capacity for explosives is also being designed for firing under the same conditions, as regards velocity and pressure, as the regulation projectiles."—*Engineering.*

REORGANIZATION OF THE ECOLE NAVALE.—An important *projet de loi* for the reorganization of the "Ecole Navale" is being considered by the Conseil Supérieur de la Marine, the proposals in some way following the reforms effected regarding the entry of officers in our navy, the object being the same, namely, to assure unity of origin for the different branches; the *projet de loi* also provides for the promotion from the ranks of a certain number of petty officers and seamen.

The different branches affected by the proposal are, "Officiers de marine, officiers mécaniciens, ingénieurs de génie maritime, ingénieurs hydrographes, and ingénieurs d'artillerie."

The entry of candidates for this single naval school of the future, whose creation is asked for by the *projet de loi*, will be by competitive examination at a minimum age of 18, and all candidates will be required to have served one year at sea before the mast. The period of instruction at the "Ecole Navale" will be two years, at the expiration of which the pupils will be rated aspirants corresponding to the rank of sub-lieutenant.

The new aspirants will then embark for a year in a special vessel, "Ecole d'application," and at the conclusion of this year afloat they will go for six months to one of the torpedo flotillas.

After this, specialization of the young officers will take place, and exami-

nation will be held for entry into the three "Corps d'ingénieurs," the number of vacancies being fixed each year by the Minister of Marine; those then admitted are to complete their instruction in one of the sea-going squadrons or the vessels attached to the school of gunnery, till they have completed two years in the rank of aspirant, they are then to be appointed "ingénieurs de 2me classe" (lieutenants), and will be sent to special "Ecoles d'application du génie maritime et d'artillerie."

Aspirants not admitted into the corps d'ingénieurs are classed by order of merit, and according to their position on the list they are to be allowed to select which of the two corps, officiers de marine or officiers mécaniciens, they wish to enter; those selecting the corps of officiers de marine will be sent for six months' duty with the battalion of "Apprentis fusiliers," the others will be sent for a six months' practical course to "Ecole des élèves mécaniciens."

Recruiting of officers from the rank will take place in two ways:

1. By competition between "Officiers, mariniers, quartiers-maitres, and seamen with not less than four years' service and two years' sea service, successful candidates being sent for two years to the "Ecole des élèves officiers."

2. By direct examination of men holding the ratings of "premiers maitres de manœuvre, de canonnage, de mousqueterie, de timonerie, and maitres torpilleurs," having not less than two years' sea-service, those who pass the examination being at once promoted "ensigns."

The number admitted from the ranks to the "Ecole des élèves officiers" is to be one-third of the total number of *élèves* admitted to the "Ecole navale" during the year; the number of these promoted "ensigns" is not to exceed half the number of *élèves* admitted during the year to the "Ecole des élèves officiers."

As regards recruiting from the ranks of officiers mécaniciens, the number of vacancies assigned to "Sous-officiers mécaniciens" is to be double the number assigned to aspirants from the "Ecole navale."

The "Ecole navale" is to be installed on shore at one of the naval ports, and certain vessels are to be attached to allow the *élèves* to obtain practical instruction at sea.—*Le Temps, La Vie Maritime*, and *Le Moniteur de la Flotte.—Translation from United Service Institution.*

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Schleswig-Holstein ..	13,200	Kiel.	Launched Dec. 17, 1906.
Schlesien.....	13,200	Danzig.	" May 28, 1906.
Ersatz Bayern	18,000	Wilhelmshaven.	Building.
" Sachsen	18,000	Bremen.	"
" Würtemberg .	18,600	Stettin.	"
" Baden	18,600	Kiel.	"
" Oldenburg....	18,600	—	To be laid down in 1908.
" Beowulf	18,600	—	" " "
" Siegfried	18,600	—	" " "
Armored Cruisers.			
Gneisenau	11,600	Bremen.	Launched June 14, 1906.
Scharnhorst.....	11,600	Hamburg.	Under trial.
E	15,000	Kiel.	Building.
F.	17,000	Hamburg.	"
G.....	17,000	—	To be laid down in 1908.
Protected Cruisers.			
Stuttgart	3,420	Danzig.	Under trial.
Nürnberg	3,420	Kiel.	"
Ersatz Pfeil.....	3,800	"	Building.
Dresden	3,800	Hamburg.	Launched Oct. 5, 1907.
Ersatz Greif.....	4,300	Danzig.	Building.
" Jagd	4,300	Stettin.	"
" Schwalbe.....	4,500	—	To be laid down in 1908.
" Sperber	4,500	—	" " "

THE NAVAL PROGRAM.—The *Marine Rundschau* stated that the naval program laid before the Reichstag had been received by all parties, except by the Social Democrats, with greater or less satisfaction. It was intimated that the Navy Law of 1900 would be changed only in one particular—namely, in the reduction of the age limit for battleships from 25 years to 20 years. The provision is made in a memorandum attached to the estimates, which gives a revised table of expenditure for 1908-17. This has long been pleaded for by the advocates of expansion, and, of course, the result will be to produce a reserve of battleships of an obsolescent or of not quite a rescent type, but which, nevertheless, may have their value. The *Rundschau* said that there was no intention to increase the number of ships to be constructed under the law—namely, 58 capital ships—being 38 battleships and 20 large armored cruisers, but in each of the years 1908, 1909, and 1910 three battleships, one large cruiser, two small cruisers, and two destroyer flotillas will be laid down, and the subsequent program may be subject to amendment. Considerable outlay is intended upon submarine boats, and, as to the other classes of ships, they will be more costly and of greater fighting power than the others. The total expenditure will be £16,966,186—ordinary non-recurring expenditure, £6,684,284, an increase of over £645,000; non-recurring expenditure, £5,769,375, increase of £757,802; extraordinary expenditure £4,506,757, increase of £1,638,244. Among the chief causes of the increase are the strengthening of coast fortifications, the construction of docks on the Elbe, the growing cost of new ships and armaments, the increase of submarines, the reinforcement of the *personnel*, and the provision of modern training ships.

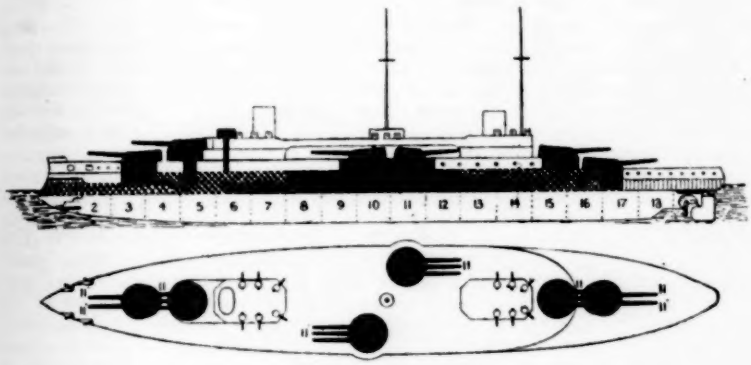
In the ordinary estimates increased votes are for pay of officers and men and ships in commission. The largest non-recurring expenditure is £5,716,500 for new construction, an increase of £1,422,500, of which £3,220,500 is to be covered by loans and charged to the extraordinary estimates. The expenditure on ordnance is to be £2,483,000, an increase of £608,000; on torpedoes, £310,000, increase, £72,500; and on mines, £41,000, increase, £24,000. First instalments are required for three new battleships, one large cruiser, two small cruisers, one river gunboat for China, and a flotilla of destroyers. A sum of £100,000 is set down for structural alterations in the battleships of the *Kaiser* class, and an equal sum for the large cruiser *Friedrich Karl* and various small cruisers. Additional ammunition for ships and forts will require a grant of £100,000, and £12,500 is to be devoted to providing reserve guns. The vote for submarines has been increased to £350,000. The total expenditure upon new construction and armaments, therefore, amounts to £8,550,500, an increase of £2,127,000 over the current estimates. The Imperial dockyards require a non-recurring expenditure of £195,125, an increase of £64,325, and the torpedo and mine branches of additional large sums for their administration. The extraordinary estimates place the dockyards at £669,700, including extensions and improvements at Kiel and Wilhelmshaven and the establishment of a turbine factory at Kiel. The vote for ordnance under the extraordinary estimates amounts to £227,167, an increase of £61,867, chiefly for purposes of coast defence. The estimates for the home office include an instalment of £1,000,000, or £250,000 more than this year, for the widening of the Kiel Canal.—*Army and Navy Gazette.*

NEW CONSTRUCTIONS.—Three battleships will be laid down in 1908 to take the place of the obsolescent *Oldenburg*, *Beowulf*, and *Siegfried*, vessels all between 4000 and 5000 tons displacement, completed in 1890. These were coast-defence ships, but the new vessels will be modern battleships. According to present intention, it is intended to similarly lay down three ships in 1909, three in 1910, two in 1911, and one battleship per annum in the remaining six years—up to 1917. The effect will be to give the German Navy 37 battleships in 1914, and as all the vessels laid down

before 1911 will then be completed, there will, it is expected, be in service in 1914 13 battleships of the newest type, of 19,000 tons or more. This includes the four battleships which have already been laid down under the old program—the *Ersatz Bayern, Sachsen, Würtemberg,* and *Baden.*

As regards cruisers, the proposal is to lay down six vessels during the next six years—one per annum. This will make eight cruisers of the most modern type. Two small cruisers are to be laid down each year from 1908 to 1916, and one in 1917. Thus it is computed that in 1920 the German Navy will include 38 battleships and 20 large cruisers, of which the majority would be of the most powerful and modern type. But 1920 is a long way off, and much may happen before that date. If Germany carries out her scheme—and each year will tell its own tale—a strong response ought to emanate from Whitehall.—*Engineering.*

Le Yacht states that the *Ersatz Bayern* and *Sachsen* are slightly smaller than the two succeeding battleships, *Würtemberg* and *Baden,* being of 17,960 tons, against the latter's 18,600 tons. The *Bayern* is nearly ready for launching. She is to carry sixteen 11-inch and twenty-two 3.5-inch



ERSATZ BAYERN.'

guns, with six under-water torpedo tubes. The 11-inch guns are of 50 calibers length and fire a projectile of 760 pounds with an initial velocity of 2850 f. s. Her main belt is 12 inches thick amidships, tapering to 4 inches forward and aft, and her turrets are 11 inches thick. She is to have turbine machinery and a speed of 19.5 knots. The figure shows the general arrangement of guns and armor on the *Bayern* and her sister ships.

The armored cruiser *G,* to be laid down this year is of 17,000 tons, like cruiser *F,* and is to carry the same battery, twelve 11-inch and twenty 3.5-inch guns.

The German cruisers *Hansa, Hortha,* and *Victoria Louise,* and the battleship *Kaiser Barbarossa,* have all undergone big refits during the current year. The *Barbarossa* is now fitted with two very high masts, and has been a great deal cut down amidships. Four 6-inch guns have been removed from the main deck.

The German 1908 program is announced. It is as follows: Three *Dreadnoughts,* one *Inflexible,* two small cruisers of 24.5 knots, 12 destroyers of large size.—*Engineer.*

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Bellerophon	18,600	Portsmouth.	Launched July 27, 1907.
Téméraire	18,600	Devonport.	" Aug. 24, 1907.
Superb	18,600	Newcastle.	" Nov. 7, 1907
St. Vincent	19,250	Portsmouth.	Building.
Collingwood	19,250	Devonport.	"
Rodney	19,250	Vickers.	Authorized.
Armored Cruisers.			
Minotaur	14,600	Devonport.	Under trial.
Shannon	14,600	Chatham.	"
Defence	14,600	Pembroke.	"
Invincible	17,250	Newcastle.	Launched Apr. 13, 1907.
Inflexible	17,250	Clydebank.	" June 26, 1907.
Indomitable	17,250	Glasgow.	" Mar. 16, 1907.
Cruiser.			
Boadicea	3,300	Pembroke.	Building.

THE TRIBAL CLASS OF DESTROYERS.—The official six hours' full-speed trial of H. M. S. *Tartar*, built for the British Admiralty by Messrs. Thornycroft & Co., has been satisfactorily carried out.

The speed obtained on the six runs over the measured mile was 35.672 knots, with mean revolutions of 775.5 per minute; while the mean speed obtained during the six hours was 35.363 knots, with mean revolutions 768.8 per minute. The highest speed attained on the measured course was 37.037 knots, with the tide. The contract speed required by the Admiralty was 33 knots, so that it will be seen that this has been exceeded by 2.363 knots by the *Tartar*.

The table herewith gives the results obtained throughout the trial.

Number.	Speed on Six Runs in Knots.	Mean Speed During Each Hour.	Mean Revolutions per Minute on Six Hours.
1	36.810	35.137	763.9
2	34.549	35.245	766.2
3	36.961	35.401	767.9
4	34.286	35.301	767.44
5	37.037	35.429	770.2
6	34.286	35.665	775.4
Admiralty mean	35.672	35.363	768.8

The *Tartar* is a vessel 270 feet long and 26 feet beam. She is built principally of high-tensile steel, and the methods adopted of constructing the hull are such as to obtain the maximum of strength for the least amount of material.

The propelling machinery is of the Parsons steam-turbine type.

The fuel used is a heavy oil, which is injected into the furnace by means of special burners of Admiralty pattern, and the boilers are of the Thornycroft water-tube type (six in number). This combination provides a steady and ample supply of steam, the working pressure being 220 pounds per square inch.

Each boiler has 5300 square feet of tube surface; the fire-box tubes are 1⅜ inches in diameter and 10 L. S. G. thick, and the remainder are 1⅛ inches in diameter and 12 L. S. G. thick.

The advantages gained by using oil fuel are very apparent, as may be observed from a photograph of the *Tartar* when running at 34½ knots, using oil fuel. There is hardly a trace of smoke from the funnels, which is due to the precision with which the necessary amount of air can be adjusted for perfect combustion. Another important matter is the freedom from the continual shower of small-ashes from the funnels falling upon

the deck, so usual in coal-burning ships, and the total absence of flaming at the funnels. Again, the ease with which the speed may be reduced almost instantly is a very important consideration.

The vessel will be fitted with wireless-telegraph apparatus. Mechanical means are provided for ventilating the engine-room when the hatches are closed in bad weather. The usual system of voice-pipes is replaced by an installation of loud-speaking telephones, fitted at all the important stations throughout the ship. The main deck is not obstructed by high coamings along the boiler-rooms—an advantage due to the use of the Thornycroft type of boiler—and thus allows of easy passage from side to side. —*Engineering.*

The *Cossack,* built by Messrs. Cammell, Laird & Co., during her trials made a mean speed of over 33 knots, and in the fastest hour did 33.65 knots, the stipulation of her contract being that she should steam at 33 knots for six hours. The *Ghurka,* Messrs. Hawthorn, Leslie & Co., has made a speed of over 34 knots. The *Tartar,* built by Messrs. J. I. Thornycroft & Co., attained a mean speed of 33.122 knots, without, it is stated, the vessel's being pressed in any way. But the most wonderful performance as yet is that of the *Mohawk,* built by J. S. White & Co. This vessel, on her six hours' official steaming trials, made a mean speed of 34.5 knots, and on the continuous run 34.25 knots. These vessels have a displacement of about 800 tons, and a length of 270 feet; they are, therefore, considerably larger and heavier than the old type destroyers, and more nearly approach in size the torpedo gunboats. They are supplied with turbine machinery, comprising five turbines, three for use in going ahead and two for driving them astern. Arrangements are also made to enable them to steam economically at cruising speed, and to give them high maneuvering power. In all cases the furnaces are arranged to burn oil fuel, no coal being carried, except a little for use in the galley. The system appears to work most successfully, and the large quantity of oil carried gives the boats a wide range of action, estimated at economical speed to be considerably over 1000 knots. For armament these vessels carry three 12-pounders of the latest type, but their newer sisters, of the second batch, will probably be supplied with still heavier guns. Two torpedo tubes are furnished, but apparently only one torpedo for each tube, an additional supply, it may be assumed, being carried in the depot ship which will accompany them. As there are seven more of these vessels authorized there should be a dozen ready for effective use before the end of the next financial year.—*Army and Navy Gazette.*

H. M. S. "SWIFT."—A vessel which will be the fastest in the world was successfully launched from the shipbuilding yard of Cammell, Laird & Co., on December 7. The *Swift,* the name by which the vessel will be known, is being built for the British Admiralty, to meet the requirements of a special type of ocean-going torpedo-boat destroyer, and is of considerably larger dimensions and higher speed than any former vessel of the destroyer class. She is designed for a speed of 36 knots per hour, as against the 33 knots of the *Tribal* class of sea-going destroyers.

Her principal dimensions are: Length between perpendiculars, 345 feet; breadth, 34 feet; depth, 20 feet 4 inches, with a displacement at her mean load draft of about 1800 tons. Her armament consists of four 4-inch breech-loading guns, two on the forecastle and two on the upper deck, and two 18-inch torpedo tubes on the upper deck. She will be propelled by quadruple turbine machinery of the Parsons type manufactured by Cammell, Laird & Co., Limited, at their Birkenhead works. As in the new large Cunard vessels, the turbines will drive four shafts, there being one propeller on each shaft. The turbines are placed in two distinct engine-rooms in order to minimize the capacity of any one water-tight compartment, and several novelties have, we are informed, been intro-

duced in order to accommodate machinery of the large power required in the comparatively small space at disposal.

There is an installation of 12 boilers of the Express straight-tube type, these being arranged for the burning of oil fuel. The boilers have been built by the firm at their Beaufort-road works.—*Engineer.*

MINOTAUR, SHANNON, AND DEFENCE.—The *Minotaur* class are now beginning to be about. They differ greatly from the *Warriors*, being less low in the water, and without the "rake" of the earlier cruisers. They are nothing like so smart to look at, as ships. A peculiarity of the *Minotaurs* is that the funnels are unequally spaced, the fore funnel being placed almost against the foremast, with a quite distinct gap between it and the other three. Also stern walks reappear, and the gun turrets are very "French" in appearance, the small barbettes under them standing up several feet from the deck.—*Engineer.*

ST. VINCENT CLASS.—We are in appreciable distance of the time when 10 battleships of the *Dreadnought* type will be afloat, and of these seven will be in commission during 1908. The *St. Vincent*, the fifth vessel of this type, has been commenced at Portsmouth. After the launch of the *Dreadnought* it was found necessary to extend the building slip considerably, and 50 feet was added before the *Bellerophon* was laid down. Since that vessel has left the slip another 50 feet has been added, and the slip is now capable of taking a ship 700 feet long. The *St. Vincent* will have a displacement of 19,200 tons, 1300 tons more than the *Dreadnought* and 600 tons more than the *Bellerophon*. Turbine engines will be fitted. The indicated horsepower will be greater than the previous *Dreadnoughts*, and sufficient to develop a speed of 22 knots. The *St. Vincent* will not be unduly hurried in construction, but will be ready for commission in two years. The sixth *Dreadnought*, named the *Collingwood*, has been laid down at Devonport, and the seventh, the *Rodney*, will be built by Messrs. Vickers Sons & Maxim. The *Rodney* is to be of the *St. Vincent* class, of 19,200 tons displacement, and will carry ten 12-inch guns, and a large number of guns of smaller dimensions. Two years is the time allowed for construction.—*Page's Weekly.*

The cost of the hull and machinery of the new battleship *Rodney*, to be built at Barrow, by Messrs. Vickers Sons & Maxim, is £628,000, and it is expected that the ship will be turned out at a total cost far below that of any similar vessel. Between the lowest and the highest tenders there was a difference of £132,000.—*United Service Gazette.*

DOCK-YARD NOTES.—We notice that there has been a recrudescence of the story that the *Bellerophon*, *Téméraire*, and *Superb* will differ from the *Dreadnought* in that the middle turret guns will fire over the after turret. There is absolutely no truth in this rumor. A little reflection will show that no advantage would be gained by being able to train the 'midship guns over the after ones, as there is plenty of room to train them without it, and firing over the after turret would probably damage everybody inside that turret, and certainly disconcert their aim.

All such points as this were gone into very thoroughly in the original *Dreadnought* design. Whatever is to be said for or against the *Dreadnought*, her guns, and the disposition of them, were only arrived at after very careful thought and due consideration. The one thing more thought of than any other was how to secure the maximum of training with the minimum of "interference." No "after thought" is therefore likely to improve on the *Dreadnought* arrangement from the practical standpoint.

The *Bellerophons* will carry exactly the same big guns as the *Dreadnought*, in exactly the same way. Their anti-torpedo boat armament may be differently placed, and the rig will be different.

The *St. Vincent* class—*St. Vincent, Collingwood,* and *Rodney*—will carry a different gun, a 50-caliber 12-inch, but will otherwise differ little from the *Bellerophons.* Just as some 17 years ago we evolved the *Royal Sovereign* design, and built to it for years with only minor alterations, so probably we shall stick to the *Dreadnought* system for a considerable time. Probably we shall stick to it until a heavier gun becomes imperative, and then we shall evolve something with all guns in the center line.

The *Inflexible* method of gun mounting—two center mountings in echelon—is unlikely to come in. It was tried in the old *Inflexible,* and in Italian ships of similar model, also in two small Brazilian ships. But it died out owing to the difficulties inherent in training across the deck, and so probably will it die out again.

A correspondent writes asking about the rig of the *Bellerophon* class. We regret that as the masts are not yet up and no definite information is available, we cannot be much more definite than to say that they will not, in any case, be rigged as the *Dreadnought.* Originally, we understand, they were to have had but a single mast, placed abaft the after funnel; now probably there will be a foremast abaft the fore funnel. Not a very gainly arrangement this, but one with certain points about it all the same.

Comparatively little is known even yet about the three cruisers of the *Inflexible* class, which have been somewhat delayed in construction. They are stated to have been retarded owing to changes in design; but there is no confirmation of this. The feature of these ships is the placing of the two amidships turrets *en echelon,* a revival of an idea of some 30 years ago, which has little to commend it save on paper. The first three turrets are all on the upper deck level, the aftermost being a deck below. There is a single big mast forward and three funnels—two forward and one aft. Very special interest attaches to these cruisers on account of their immense size and their uniform armament of eight 12-inch guns. The growing tendency in naval circles is to regard them as unnecessarily powerful as cruisers and too lightly armored as battleships. It is felt that the immense cost of production renders multiplication of the type practically impossible, and the demand for something smaller and more easy of reproduction is likely to receive attention in the 1908-09 estimates. It may, however, be observed that the case is so complicated that only war can actually decide the question as to whether a few invincible cruisers are better than a large number of less all-powerful craft.

A new feature in the fitting of the *Téméraire,* as of her sisters, is that her principal mast is of the "tripod," or three-legged type, two of the legs forming side supports to the central, or main leg; thus taking the place of the "shrouds" and "stays" in ordinary vessels. The legs are long hollow steel cylinders, connected together at their top ends, or heads, while their lower ends, or heels, are passed through the upper deck and stepped in position. The main mast, or middle leg, is 3 feet 6 inches in diameter, and weighs nearly 17 tons; while the side, or supporting legs, are 3 feet diameter, and weigh 13 tons each. The mast, as a whole, is 82 feet in length, and weighs over 45 tons; it is now safely in position on board, and as it is the first of this exceptional weight handled at Devonport, and took only five working days to complete its fixing, the work is highly to the credit of all engaged in it.

The 12-inch guns of the *Téméraire*—of which she is to carry 10—are of a new type. They are each 46 feet 4½ inches long, and weigh 56 tons 7 cwt., being 11 feet longer and 10 tons heavier than earlier guns of the same caliber.

Although blocks were laid early last April for the building of the unarmored cruiser *Boadicea* at Pembroke Dock-yard, it was not until the first of July that the first keel-plate of the vessel was laid. As noted in our

issue of July 5, this vessel will be fitted with turbine propelling engines of 18,000 indicated horsepower, the contract for the construction of which has since been placed with John Brown & Co., Limited, and they are to be completed in time to enable the vessel to run her steam trials before next August.

The British cruiser speed record for the year is held by the *King Alfred*, which on her eight hours' sea trial did for one hour 25.1 knots, and for the whole eight hours attained a mean of 24.8 knots. This is the mean reached by the *Drake* in her last year's record. This year the *Drake* has not made so much, 24.6 being the highest recorded.

In the eight hours' passage trial at full power in the Second Cruiser Squadron the order was—*Drake, Devonshire, Carnarvon*, and *Antrim*. The *Drake* is the better steamer of these four ships by about two-thirds of a knot, being a 23-knotter against 22.33 of the others. The *Drake* did 24.3, the *Devonshire* 22.7, the other two *Devonshire* class vessels about 22 knots.—*Engineer*.

ADDITIONS TO THE NAVY IN 1907.—The vessels floated for the British Navy in 1907 number 29, with a tonnage of 132,118, while the engines of these—all with one exception of the Parsons turbine type—represent a collective horsepower of 373,800 indicated horsepower. The total value of these vessels when completed will be practically £13,500,000 sterling. This is the largest addition since 1903, when 35 vessels were floated, of 148,700 tons, and of a value of £12,000,000; while in 1901 209,000 tons were floated, of a value of £15,900,000. The past year's total comes as a satisfactory change from the comparatively low figures of the three preceding, and it is well that the recent rate of production is likely to be maintained, if not, indeed, to be increased.

Not only have we launched three battleships and four armored cruisers, but six destroyers and thirteen torpedo-boats. Indeed, the year has been a notable one in connection with torpedo craft. Consequently, the total output of the year rises to a high figure. Below is a tabular statement showing the past year's record:

	No.	Tons.	Indicated Horse Power.	Value of Ships Completed.
In 1907. Dock-yards.....	3	51,800	73,000	£4,960,000
Private yards (H. M. S.).....	26	80,318	300,800	8,556,000
" " (foreign)	4	561	15,035	96,000
Total in 1907	33	132,679	388,835	£13,612,000

There are now in hand at private yards several important ships to the order of foreign firms, and before the end of the present month two new British battleships will have been officially commenced.—*United Service Gazette*.

The naval war course at Portsmouth concluded on January 23. The course, which has lasted four months, was attended by six flag officers, 24 captains, 20 commanders, six lieutenants, three military, and two marine officers. Lectures were given on strategy, tactics, naval history, marine engineering, coast defence, combined operations, the Russo-Japanese war, stability of ships, ocean transport, explosives, and other subjects of naval and military interest. During the session a joint naval and military staff exercise was undertaken in conjunction with some officers of the Portsmouth Garrison. Captain E. J. W. Slade, M. V. O., formerly in command of the War College, on appointment as director of naval intelligence, was succeeded on November 1 by Rear-Admiral R. S. Lowry. The staff of the college has also been augmented. In consequence of this augmentation, two additional offices are now being built.—*United Service Gazette*.

STEAM-TRIALS IN 1907—ARMORED SHIPS.

Name of Vessel.	Type of Ship.	Displacement.	Type of Boilers.	Heating Surface.	Grate Area.	First 30 Hours' Trial.				Second 30 Hours' Trial.				Eight hours' Full-Power Trial.			
						Indicated Horse-power.	Speed.	Coal per Indicated Horse-power per hour.	Water per 1000 I. H. P. per 24 hours.	Indicated Horse-power.	Speed.	Coal per Indicated Horse-power per hour.	Water per 1000 I. H. P. per 24 hours.	Indicated Horse-power.	Speed.	Coal per Indicated Horse-power per hour.	Water per 1000 I. H. P. per 24 hours.
		tons		sq. ft.	sq. ft.		knots	lb.	tons		knots	lb.	tons		knots	lb.	tons
Agamemnon..	Battleship	16,500	Yarrow.	50,965	848.7	3494	11.79 M. M.	2.15	2.98	12,023	17.057 M. M.	1.9	1.76	17,285	18.735 M.M.	2.14	1.66
Warrior.....	Cruiser first-class armored	13,550	Yarrow and cylindrical	55,834	971.1	4781	14.7 bearings	2.01	3.6	16,361	20.7 M.M. 19.96 throughout the trial 21.471 M.M.	2.06	3.01	23,705	22.46 M.M. 22.409 throughout the trial	2.33	3.1
Minotaur	Ditto	14,600	Babcock & Wilcox	73,294	2083.8	9643	14.107 M.M. 14.39 M.M.	1.74	2.9	10,750	21.4 bearings	1.68	0.92	27,856	23.01 M.M.	1.59	1.2
Shannon.....	Ditto	14,600	Yarrow	80,424	1365	5849	14,829 throughout the trial	1.96	2.26	19,621	20.92 M.M. 20.765 throughout the trial	1.83	1.733	28,553	22.49 M.M. 22.6 bearings	2.01	2.6

OCEAN-GOING TURBINE-DRIVEN TORPEDO-BOAT DESTROYERS.

FIRST-CLASS TURBINE-DRIVEN TORPEDO-BOATS (NEW TYPE).

Name of Vessel.	Type of Vessel.	Builders of Vessel and Makers of Machinery.	Type of Boilers.	Heating Surface.	Speed on Six Hours' Run.	Number of Boat.	Builders of Boat and Makers of Machinery.	Type of Boilers.	Heating Surface.	Speed on Eight Hours' Run.
				sq. ft.	knots				sq. ft.	knots
Cossack.	Ocean-going t. b. d.	Cammell, Laird & Co.	Laird	29,000	33.144 M.M. 33.09 six hrs.	3 4 5	J. S. White & Co. Ditto Ditto	White-Forster Ditto Ditto	8000 8000 8000	27.077 M.M. 26.385 eight hrs. 27.077 M.M. 26.295 eight hrs. 27.521 M.M. 26.796 eight hrs.
Tartar ..	Ditto	Thornycroft	Thornycroft modified	31,800	35.672 M.M.	8	J. I. Thornycroft & Co.	Thornycroft modified	8200	27.084 M.M. 27.197 eight hrs.
Ghurka ..	Ditto	Hawthorn, Leslie & Co.	Ditto	27,550	35.36 six hrs. 33.997 M.M.	9 10	Ditto Ditto	Ditto Ditto	8200 8200	27.196 M.M. 26.734 eight hrs. 26.182 M.M. 26.265 eight hrs.
Mohawk.	Ditto	J. S. White & Co.	White-Forster	29,580	33.91 six hrs. 34.5 M.M. 34.245 six hrs.	11 12 23	Yarrow & Co. Ditto Ditto	Yarrow Ditto Ditto	8004 8004 8004	27.163 M.M. 27 eight hrs. 27.206 M.M. 26.814 eight hrs. 26.796 M.M. 26.723 eight hrs.

M.M. = Measured Mile.

—*Engineering.*

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Roma	12,625	Gov't Yard, Spezia.	Launched Apr. 21, 1907.
Napoli	12,625	" " Naples.	" Sept. 10, 1906.
Vittorio Emanuele	12,625	" " Castellamare.	Under trial
A	19,000	" " —	To be laid down in 1908.
Armored Cruisers.			
San Giorgio	10,200	Gov't Yard, Castellamare.	Building.
San Marco	10,200	" "	"
Pisa	10,200	Orlando Works.	Launched, Sept. 15, 1907.
Amalfi	10,200	Odero Works.	Building.
B	10,200	Leghorn.	"

Le Yacht states that the Naval Budget for 1908-1909 is to be 138,893,321 francs, an increase of four millions over that of the preceding year, this being partly due to increased pay for officers and men. New constructions call for 35,658,000 francs, of which 6,000,000 are for the new 19,000-ton battleship and 11,000,000 for the purchase of the *Pisa* and *Amalfi*. The program includes four 19,000-ton battleships, six cruisers of 3000 tons, and 28 knots speed, and several torpedo-boats. One 19,000-ton battleship has been ordered laid down.

THE REGINA ELENA.—The first of the *Victor Emanuel* class to be completed, the *Regina Elena*, has been visiting Portsmouth, and additional details gleaned on an inspection of her may be of interest.

The designer of the class is Colonel Cuniberti, of the Corps of Italian Naval Constructors, and a very casual inspection of the *Regina Elena* is sufficient to convince anyone that his genius does not stop at imaginary *Dreadnoughts*. The ship is only of 12,625 tons displacement, but in the very fact of this small displacement lies the marvel. She is quite the last word in economy of weights and utilization of space.

The armament is as follows:

Two 12-inch 45-caliber (Armstrong)
Twelve 8-inch 45-caliber "
Twelve 12-pounders "
Twelve 3-pounders "
Four Maxims
Four 18-inch submerged tubes (Elswick patent).

The 12-inch guns, which are very similar to the *Dreadnought's* pieces, are carried in cradle mountings similar to those adopted for our new *Dreadnoughts*. The turrets, placed fore and aft in the center line, are extremely roomy. Each carries a single gun only. This is the most criticised feature of the ship; but it should be borne in mind that a pair of guns in a turret do not make twice as good shooting as a single gun, and—sacrifices being necessary on the displacement—this was probably the wisest that could be made. These 12-inch and also the 8-inch guns are all electrically maneuvered; all hoists also are electric. The big gun turrets are placed quite clear of all upper works, and have an enormous arc of training, something like 300° instead of the usual 240° or less. In many positions, therefore, the ship can deliver as much 12-inch fire as the usual four big gun ship; the 8-inch turret bases extend down to the armored deck, everything being extremely roomy.

The 8-inch guns are carried in pairs in six turrets amidships, the central turrets being raised so as to fire over the end turrets. Eight 8-inch guns can, therefore, fire ahead, and have been actually so fired without any inconvenience to the guns fired over. There are no fittings of any sort or kind in the way of these guns, but a perfectly smooth floor ahead and astern. Each upper turret has an actual arc of 180°, the others 135°. The bases of all are heavily armored, and have also armored splinter screens, and there is no diminution of thickness on the inner side.

Eight of the 12-pounders are carried in the amidships battery behind 3¼-inch armor, the remainder, two about the conning-tower and two on the similar topside aft.

Fire control is from the top of the conning-tower, where there is a heavily-armored station. It is not so suitable perhaps as the mast platform of the British Navy, but practically invulnerable, which mast stations are, undeniably, not. Barr and Stroud instruments are now being fixed. The whole of the necessary wires are carried down in a thickly-armored tube, and unlikely to suffer any injury.

The armor protection generally is very great. There is a 10-inch water-line belt amidships, thinning to 6 inches under the turrets and 4 inches at the extremities. It is surmounted amidships by an 8-inch redoubt approximately 160 feet long, side and bulkheads being of uniform thickness. Thin armor is carried forward to the bow from this redoubt, protecting the whole lower deck. Above the redoubt is the 3¼-inch 12-pounder battery. The conning-tower is 10 inches thick, and built in stories reaching down to an under-water control station. There are also stations in the forward big gun turret and the two amidships 8-inch turrets. Great use is made of coal protection in addition to the armor. Normally the ship carries 1000 tons, but there is room for no less than 2800 tons.

The principal interest of the *Regina Elena*, however, lies in the engineering department. She is the fastest battleship in the world, being a good deal swifter than even the *Dreadnought*, with which ship, by the way, she shares the peculiarity of a greatly overhung stern. She is 475 feet over all, against 435 feet between perpendiculars.

The propelling machinery, manufactured by the firm of Odero, of Sestri Ponente, consists of two sets of four-cylinder vertical inverted triple-expansion engines, balanced on the Yarrow-Schlick and Tweedy system. These engines are a very fine piece of workmanship. The engine-rooms are as roomy as in our big ships. Instead of two large condensers, four of medium size are fitted, and appear to be very satisfactory. The dynamo-room is also amply large, the switchboard being mounted on a platform high up and clear of everything—there is none of that cramping which might perhaps have been expected.

Steam is supplied by 28 Belleville boilers, designed to give 20,000 horse-power. They are in three groups—two of ten each, and one room of eight. These Bellevilles are of a considerably more modern pattern than those with which we are usually familiar in British warships. In main features they do do not differ from those in our *Drake* and *Duncan* classes, but there are many refinements of detail. They are, of course, free from that loss of water which characterized our earliest Bellevilles, but that applies equally to any of our more modern ships so fitted. One detail is that the tubes do not bend to any appreciable extent. In the *Regina Elena*, after 1500 hours' steaming, the bend in no tube exceeded one millimeter, and there has been a total absence of anxiety about the screw joints. The performance of the boilers on trial is said to have been extremely successful, and apparently this is correct, since Italy, which, after our boiler committee's decision, also discarded Belleville generators, has now re-adopted them and ordered this type for all three of the ships recently laid down—*Pisa*, *Amalfi*, and another unnamed.

The designed speed of the *Regina Elena* is wrapped in some mystery, as it is variously given as 20 knots, 21, and 22 knots. The contract speed appears originally to have been 22 knots, reduced to 21.5 after the decision to fit this vessel and the *Vittoria Emanuele* as flagships, which involved a good deal of additional weight on the top-sides. The other two ships of the class, the *Napoli* and *Roma*, will not be so fitted, and are expected to be about half a knot faster in consequence of this and other weight reductions.

On trial at three-quarter power the *Regina Elena* developed 15,473 indicated horsepower and a speed of 20.33 knots. On the full-power trial about

23,000 horsepower was developed, and the speed was 21.7 knots. For short runs this was slightly exceeded, but 21.7 seems to be about the maximum speed of the ship. On subsequent service trials it was found that with 25 boilers alight she could quite comfortably maintain 20 knots for any length of time. The economical speed is 15 knots.

In conclusion, it may be mentioned that the magazines are fitted with special refrigerators to maintain an even temperature of 20° Cent. There is practically no uncovered wood anywhere in the ship, all the cabin furniture being made of Uralite or some similar asbestos compound. Cupboards, tables, and so forth are all of this material, so that there is practically no risk whatever of fire in action. The ship is fitted with wireless telegraph instruments of the usual Marconi type.—*Engineer.*

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Satsuma	19,200	Yokosuka.	Launched Nov. 15, 1906.
Aki	19,800	Kure.	" Apr. 15, 1907.
Huki	19,800	Yokosuka.	Building.
Armored Cruisers.			
Ibuki	14,600	Kure.	Launched Nov. 21, 1907.
Kurama	14,600	Yokosuka.	" Oct. 21, 1907.
Protected Cruiser.			
Tone	4,100	Sasebo.	" Oct. 24, 1907.
Scouts.			
Yodo	1,350	Kobe.	Building.
Mogami	1,350	"	"

The new Japanese battleship laid down at Yokosuka last May has been named *Huki*. It is understood that the original decision to give her twelve 12-inch guns has been abandoned, and she will mount only ten 12-inch, together with a greatly increased battery of 6-inch and 4.7's—both calibers being apparently decided on for her.

The 4.7's are, of course, anti-torpedo-boat armament, but the 6-inch appear to have been selected on exactly the principle that such guns were selected before the war. Japan's adherence to the 6-inch is interesting and remarkable, so much having been written here about its uselessness, as demonstrated at Tsushima. Apparently the Japanese were too busy sinking the Russians to observe the demonstration, or else they saw more than some of the experts who were not there.—*Engineer.*

According to a recent photograph of the *Mikasa*—or what purports to be a recent photograph—this ship remains exactly as she did at Tsushima. The photograph is certainly fairly recent, as no guns are on board, so it was taken after her salvage. The upper deck 6-inch casemates remain as before—turrets to carry 10-inch guns are conspicuous by their absence, and we begin to suspect more than ever that the four 10-inch added to her armament was a proposal rather than much else. We do not see how the extra weight could be managed. If it be attempted, we fancy that it will be no more successful than our increase of armament to the *Centurions*. These ships were never very fit for fighting, but they steamed splendidly. After reconstructions, they were still unfit for modern battle, and also unable to steam. No reconstruction involving additional weights has ever succeeded yet, nor is any ever likely to. The original designer, we may be sure, put into armor and armament all the weight that he could. Since then guns and armor may have improved much, and ways of building ships to carry a greater percentage of these things may have been elaborated, but a ton still weighs a ton. The talented but much-criticised gentlemen who design battleships may not always hit upon an absolute best, but they certainly do not leave neglected chances to carry several hundred tons extra. The naval architect usually wins his crown of glory

what time other people begin to improve upon his handiwork. Had the *Mikasa* been safely able to carry the weight of four extra 10-inch guns and mountings and armor—a trifle of from anything between 500 and 1000 tons—she would have steamed out of Vickers & Maxim's yard with that weight used up to the last ounce.—*Engineer.*

Le Yacht states that the new Japanese naval program includes four (not two) battleships of 19,600 tons and 20 knots' speed; five armored cruisers of 18,500 tons and 25 knots, carrying each six 12-inch, fourteen 6-inch, and ten 4-inch guns; two 4800-ton scouts of 26 knots' speed; and four 890-ton destroyers of 26 knots' speed. These ships are all to be finished in 1911; two battleships are to be built in Japan, and one battleship and one armored cruiser in England.

It is said that the original plans for battleships of 21,000 tons and twelve 12-inch guns were modified as a result of Admiral Yamamoto's visit to Europe. As now planned, they are to closely resemble the *Saint Vincent* class (19,600 tons and ten 12-inch guns), but are to have only 20 knots' speed instead of the latter's 21 knots. The armored cruisers *Ibuki* and *Kurama* are each to have four 12-inch, eight 8-inch, and twelve 6-inch guns; the former is to have turbines and the latter reciprocating engines.

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Emperor Paul I	16,900	St. Petersburg.	Launched Sept., 1907.
Andrei Pervozvannui	16,900	"	" Oct. 20, 1906.
Evstafi	12,500	Nicolaiev.	" Oct. 1906.
Ivan Zlatoust	12,500	Sevastopol.	" May 13, 1906.
Armored Cruisers.			
Admiral Makaroff	7,800	La Seyne.	Under trial.
Bayan	7,800	St. Petersburg.	Launched Aug. 15. 1907.
Pallada	7,800	"	" Nov. 10, 1906.
Rurik	15,000	Vickers.	Under trial.
Protected Cruiser.			
Outchakoff	6,750	Sevastopol.	Building.

The Russian armored cruiser *Admiral Makaroff*, built by the Forges et Chantiers de la Mediterranée at La Seyne, Toulon, made 22.55 knots on her full power trials—that is 1.55 knots over the contract speed. She is a sister to the famous *Bayan*, and differs from her only in having a solitary mast, placed between the funnels. A single mast is the regulation for all Russian armored cruisers now. Both the *Rossia* and the *Gromoboi*, which used to have three, are now reduced to a solitary mast.—*Engineer.*

UNITED STATES.

VESSELS BUILDING.

No.	Name.	Speed. Knots.	Where Building.	% of Completion Feb. 1, 1908.
	Battleships.			
23	Mississippi	17	Wm. Cramp & Sons.	99.5
24	Idaho	17	Wm. Cramp & Sons.	95.9
25	New Hampshire	18	New York Shipbl'g Co.	97.8
26	South Carolina	18.5	Wm. Cramp & Sons.	36.4
27	Michigan	18.5	New York Shipbl'g Co.	41.6
28	Delaware	21	Newport News.	9.2
29	North Dakota	21	Fore River.	17.5
	Armored Cruisers.			
12	North Carolina	22	Newport News.	97.0
13	Montana	22	Newport News.	93.4
	Scout Cruisers.			
	Chester		Bath Iron Works.	96.2
	Birmingham		Fore River Shipb'g Co.	96.2
	Salem		Fore River Shipb'g Co.	93.9

SECRETARY OF NAVY RECOMMENDS THIRTY NEW NAVAL VESSELS.—The Secretary of the Navy, in his annual report, recommends that our naval forces be increased to the extent of thirty new vessels, of a total cost of $69,270,000. Here is the list:

Number and class.	Approximate unit cost.	Total cost.
4 battleships (of the same type as the *Delaware* class)	$9,500,000	$38,000,000
4 scout cruisers (of the same type as the *Chester* class)	2,500,000	10,000,000
10 destroyers (of the same type as those recently contracted for)	850,000	8,500,000
4 submarines (of the same type as those recommended as the result of the recent competitive tests, provided a more satisfactory type is not developed in the meantime)	380,000	1,520,000
1 ammunition ship	1,750,000	1,750,000
1 repair ship	2,000,000	2,000,000
2 mine-laying ships (conversion and equipment for that purpose of 2 cruisers now on the navy list)	250,000	500,000
4 fleet colliers	1,750,000	7,000,000
Total		$69,270,000

"It is true," says Secretary Metcalf, "that our navy at the present time is the second in efficiency. Our position, however, is largely due to the fact that during the past fiscal year our sea strength and fighting efficiency have been increased by the completion and delivery of a number of new battleships and cruisers of the largest and most approved type, but we will not maintain this position very long unless Congress shall authorize the building of additional ships. It is of the highest importance that old and practically obsolete ships be replaced by ships of the newest type. It is pretty generally conceded that the battleship is the fighting machine, and it is also pretty generally conceded that the most effective battleship is the all big gun ship of the *Delaware* type. As compared with other naval powers, we are deficient in destroyers and submarines, and are also woefully deficient in colliers."—*Nautical Gazette.*

ENGINEERING COMPETITION IN THE NAVY.—The announcement that an engineering competition between the ships of the navy is to be inaugurated suggests possibilities of great usefulness, including increased efficiency in a most important department of our fighting fleets. According to dispatches from Admiral Evans' fleet, the plan is that each ship shall maintain a complete record of speed efficiency and economy; the amount of coal burned; the number of hours run under natural and under forced draft; distance covered and speed obtained, and all other details included in the operation of a ship that come within the province of the engineering staff. The competition will be between vessels of the same class and the award of honor made annually. It will be along the same general lines as the competition in marksmanship, which has assisted materially in raising the standard in the navy. Competitive engineering might easily have a like effect upon the engineering ability of the crews, which, if not of a high order, might be as disastrous in time of war as poor marksmanship, but if superior to that of the enemy, must be of inestimable value strategically.

An incentive to do the best is always an advantage; it is inherent in human nature to respond to the stimulus of competition. Each ship's engineering staff will be keen to improve appliances and equipment and their handling, but what is more important and in itself justifies the competition will be the effect upon the general knowledge necessary in the

design of new ships and their equipment. At present certain engineering records must be kept, but doubtless they would be carried into greater detail in securing the data upon which to base the awards of merit and be that much more valuable.—*Iron Age.*

LAKE SUBMARINE FOR NAVY.—The Lake Submarine Boat Co. has accepted the proposition of Secretary Metcalf to build a submarine boat at their own expense to be paid for if accepted out of funds of $778,000 reserved from the three millions appropriated for submarine competition. The Lake Company offered to build either a 500-ton or a 300-ton boat. The board on construction has examined the proposal and made a report to the Secretary which will be made public in a few days. It is believed that a boat of 500 tons of 16 knots' speed and a 2000 miles' steaming radius, costing $50,000, will be selected.—*Nautical Gazette.*

Irrespective of the relative advantages of Manila Bay and Subig Bay as the site for our principal naval base in the Philippines, the unanimous vote of the Joint Army and Navy Board in favor of Manila is most commendable. Honest differences of opinion had already delayed the settlement of this important question much too long, but now that it has been adjusted the Government can go ahead with the construction of the large naval base in the islands which our expanding naval interests on the Pacific so urgently require. The work will incidentally involve the construction of powerful fortifications on the islands commanding the entrance to Manila Bay, and one great advantage of those defenses lies in the fact that the guns mounted there will be placed at an altitude of some 500 feet above sea level, from which they would be able to pour an almost irresistible fire upon a hostile fleet. The adoption of Manila Bay as the site for the projected base will, of course, require the removal of the great dry-dock Dewey from Subig Bay to Cavite, where a well-equipped naval station has already been established and where the dock will probably be made available for the docking of commercial vessels. The naval members of the Joint Army and Navy Board contended earnestly in favor of Subig Bay as the site for the proposed base, but they finally yielded to arguments of the military members, one of those arguments being that an army of 100,000 men would be required to guard Subig Bay against a land attack. In view of the settlement of this question it is to be hoped that Congress may act favorably upon the recommendation made by the Secretary of War in his recent annual report, that $6,488,000 be appropriated for the construction of batteries on Manila Bay and Subig Bay. —*Army and Navy Journal.*

ORDNANCE AND GUNNERY, TORPEDOES.

GUNNERY EFFICIENCY IN THE BRITISH NAVY.—The results of the test of gunlayers with heavy guns in His Majesty's Fleet in 1907 were as follows:

		1905.	1906.	1907.
Number of ships that fired		100	89	121
Number of guns		1,096	1,073	1,365
Number of hits	1906 target	4,734	5,733	7,547
	1907 "	....	....	4,073
Number of misses	1906 "	3,357	2,328	1,991
	1907 "	....	....	5,465
Excess of hits over misses	1906 "	1,017	3,405	5,556
	1907 "	....	....	Nil.
Excess of misses over hits	1906 "	Nil.	Nil.	Nil.
	1907 "	....	....	1,392
Percentage of hits to rounds fired	1906 "	56.58	71.12	79.13
	1907 "	....	....	42.70

Hits per gun per minute—		1905.	1906.	1907.
12-in. and 10-in.	1906 "	.58	.81	.61
	1907 "	....	....	.40
9.2-in.	1906 "	1.40	2.84	3.25
	1907 "	....	....	2.01
7.5-in.	1906 "	....	....	3.48
	1907 "	....	....	1.58
6-in. Q.F. and B.L.	1906 "	4.14	5.68	5.93
	1907 "	....	....	3.32
4.7-in. and 4-in. Q.F.	1906 "	3.73	4.96	5.73
	1907 "	....	....	2.38
Number of ships from whom no returns were received		Nil.	Nil.	3

The subjoined abstract for 1907 gives in the order of merit, the name of the particular fleet or squadron, the number of ships, the number of men firing, the points per man, the name of the first ship in the fleet, and the scores:

Fleet or Squadron.	No. of Ships.	No. of Men Firing.	Points per Man.	First Ship in Fleet.	Scores.
China	6	74	59.783	*King Alfred*	74.76
Atlantic and Second Cruiser	13	176	44.967	*Albion*	62.35
Mediterranean and Third Cruiser	14	175	42.990	*Prince of Wales*	62.98
Channel and First Cruiser	16	228	34.835	*Vengeance*	49.58
Home and Fifth Cruiser	41	468	34.206	*Achilles*	76.34
Australia	9	90	31.531	*Powerful*	50.00
East Indies	4	38	27.129	*Perseus*	34.24
Cape of Good Hope	3	29	24.613	*Hermes*	42.95
N.A. and W.I. and Fourth Cruiser	3	24	22.635	*Indefatigable*	36.32
Special Service, Tenders, etc.	12	63	21,830	*Skipjack*	38.89
Total, 1907 target	121	1,365	36.884		
Total, 1906 target	121	1,365	68.416		
Total, 1906 test	80	1,073	80.065		

It will be observed that the "points per man" for 1907, on 1906 pattern target, is considerably lower than for 1906. This is due to the value per hit in 1907 being less than it was for the 1906 test. If the "points per man" are calculated on the value per hit in 1906 test, the "points per man" for 1907 will be 84.385. Classified in the order of merit of the individual ships competing the results are as follows in respect of the first twenty vessels:—(1) *Achilles* 76.34 points, (2) *King Alfred* 74.76, (3) *Prince of Wales* 62.98, (4) *Albion* 62.35, (5) *Venus* and *Bedford* 60.90 each, (7) *Prince George* 56.57, (8) *Albermarle* 55.86, (9) *Monmouth* 55.83, (10) *Formidable* 55.71, (11) *Black Prince* 55.61, (12) *Astræa* 54.04, (13) *Victorious* 53.46, (14) *Warrior* 53.08, (15) *Kent* 52.78, (16) *Cæsar* 52.19, (17) *Exmouth* 51.59, (18) *Irresistible* 51.10, (19) *Flora* 50.38.

In an Admiralty Memorandum it is stated that "their Lordships note with extreme satisfaction the further improvement in the results as compared with those obtained in 1906, when the shooting showed a marked advance over previous years." The award of the medal will be promulgated in due course.—*United Service Gazette.*

HADFIELD PROJECTILES.—The accompanying illustration of the performance of the Hadfield 12-inch armor piercing projectiles which are now being supplied in large numbers to the British Navy is interesting. Such projectiles carry bursting charges of from 2½ to 3 per cent of their weight.

THE HERO EXERIMENT.—The bombardment of the old battleship *Hero* took place on November 30, when the old warship was terribly

RECORD OF HADFIELD'S 12-INCH "HECLON" CAPPED ARMOR-PIERCING SHELL.
FIRED AT SHOEBURYNESS ON JANUARY 31, 1908. ROUND 5004.

This "Heclon" Shell, Fired with a Velocity of 1986 F.S., Perforated a 12-inch Krupp Cemented (K.C.) Plate, 3 Feet of Oak Backing, and, After Indenting Two Heavy Steel Plates in the Butt, was Recovered undamaged in 24 Feet of Sand, as Shown by Sketch Below.

HALF SECTION OF PROOF CHAMBER SHOWING PATH OF SHELL.

SHELL BEFORE FIRING.

HADFIELD'S 12-INCH HECLON CAPPED ARMOR-PIERCING SHELL.

After Perforating 12-inch K.C. Plates With a Striking Velocity of 1950 F.S. Each of these Shell Represents a "Lot" of 400 Supplied to the British Government, or Nearly 4000 12-inch Shell.

RECOVERED AFTER FIRING.

damaged by the fire of the Channel Fleet's guns. A special correspondent of the *Daily Express* thus describes the experiments which were held at the Kentish Knock: The doomed ship had been moored in an east and west direction, so that she presented her full broadside to the attacking ships. The battle squadron steamed past very slowly, closing up to 6000-8000 yards for the firing. The *King Edward VII*, flagship of Lord Charles Beresford, led, followed by the rest of the ships in pairs. The firing ships were the *Hibernia* and *Dominion*, two of the finest ships in the navy.

The first six shots were all misses, and although sparks began to fly from the *Hero* as soon as the range was found, the shooting was by no means up to the level of battle practice, notwithstanding that the weather conditions were absolutely perfect—a calm, clear day, with the sun behind the firing ships. Very soon the *Hero* was in the middle of a dense cloud of smoke, through which, now and again, flashed great tongues of fire, as shell after shell struck the helpless old warrior. It was soon over, however, and save for a slight list to port there was nothing to show, at a distance, the ordeal through which she had passed. The funnel and mast both stood, and very little smoke issued from her interior, but a closer inspection revealed the full extent of the damage.

The upper deck had been blown up by the explosion of a heavy shell underneath it, the after-conning-tower had been penetrated, and one of the lay-figures had daylight through his chest. Altogether 28 hits had been scored out of about 130 rounds. There was a small hole through the funnel, but most significant and important of all, a splinter of shell—not a direct hit—had gone through the mast, and, although this still stood, it had severed every control wire in it. Thus was the most urgent problem of the trials solved in the first two minutes. Would the modern system of fire control withstand for long the attentions of a straight-hitting enemy? Here was a ship fitted with the control apparatus, whose maintenance is absolutely essential during battle, and here were ships which hit their target once in every four rounds; and the whole fire control system had been reduced to impotence in two minutes.—*United Service Gazette.*

The most complete accounts of the very secret trials at the Kentish Knock last week, when the *Hero* was fired at by a couple of ships of the Channel fleet, is to be found in the *Daily Express*. Indeed, one might quite imagine that the account had been written by the same authority that gave the *Standard* the other day a very detailed description of battle practice. This correspondent states "the first six shots were all misses, and although sparks began to fly from the *Hero* as soon as the range was found, the shooting was by no means up to the level of battle practice, notwithstanding that the weather conditions were absolutely perfect—a calm, clear day, with the sun behind the firing ships." We wonder if anyone else who was present will endorse this statement. It may be remarked, also, that the *Daily Mail* correspondent says the shooting was extremely accurate, that the single mast and funnel were shot away, and the unarmored portions of the hull completely riddled. Possibly this correspondent was not afforded the same facilities as that of his rival in the halfpenny press, for the *Daily Express* recorder states that "the funnel and mast both stood, and very little smoke issued from her interior. . . . . Altogether 28 hits had been scored out of about 130 rounds. There was a small hole through the funnel, but most significant and important of all, a splinter of shell—not a direct hit—had gone through the mast, and although this still stood, *it had severed every control wire in it.*" Now how could it have been possible for this correspondent to learn this important fact—if it is a fact? But this was not all that he learnt, for at the second day's firing, when he says the shooting was far better than on the preceding day, "quite one-half of the shots went home, and the funnel was sent over by a shell which burst inside. . . . . Huge girders were

twisted like pieces of wire, heavy iron plates were torn from their fastenings and flung across the deck as though they had been tea-trays, while scarcely a square yard of any of the decks save the armored deck was whole." This reads quite like the description by Semenoff of the battle of Tsushima, and the effects of the "portmanteaus" on board the *Suvaroff*. Anyway, all the correspondents are agreed that the fire control system as fitted in the *Hero* was proved to be valueless.—*Army and Navy Gazette.*

GUNS FOR TÉMÉRAIRE AND MINOTAUR.—The following interesting particulars are given of the battleship *Téméraire*, which is being completed for sea at Devonport. In the first place, it will be armed with 10 breech-loading 12-inch guns of a new type. The first of these has just been delivered from the Armstrong works at Elswick. It is 46 feet 4¼ inches long, or 11 feet longer than the "Mark 8" guns mounted in the *Majestic* class, while its weight is 56 tons 7 cwt., against 46 tons of the earlier type. It has a very large breech, with a somewhat abrupt taper commencing near the rear throat rings, and terminating in a very long muzzle end. Its full charge of cordite will be 260 pounds, against 174 pounds used in the "Mark 8" gun. The new type of gun, which is to be known as the *Dreadnought*," will have a muzzle velocity of 2900 feet per second, and a total muzzle energy of 48,000 feet tons. A special feature will be a powerful quick motion breech-gear attachment.

The guns for the cruiser *Minotaur*, which were delivered at Devonport last week, are regarded as the finest examples of the 9.2 armament that have ever been produced. The guns are Mark XI pattern as follows: Weight, 29 tons; length, 39 feet 6 inches; range, 12,000 yards; projectile, 380 pounds; cordite charge, 130 pounds; muzzle velocity, 2900 feet per second; armor penetration at 3000 yards, 11½ inches of steel; energy, 21,000 foot tons. The mountings weigh 65 tons, and each shield is about 78 tons in weight.—*United Service Gazette.*

HADFIELD'S RANGE DIAGRAM.—The accompanying diagram, prepared by Messrs. Hadfield, of Sheffield, provides a most convenient method of ascertaining the penetration of certain guns, assuming the impact at right angles. This diagram can be used, by the method indicated, to determine either the range at which any assigned penetration can be obtained by a particular gun, or the penetration which is possible at any assigned range.

It is assumed that the plates have a "figure of merit" of 1.8, and the method of using the diagram is illustrated in the following example.

Example.—At what range should a 12-inch armor-piercing shot just perforate a 9-inch K. C. plate?

From the point of intersection of the vertical ordinate "9" on the "thickness" scale and the 12-inch perforation curve (in red) carry horizontally to the 12-inch range curve (in black). The vertical ordinate shows 9500 yards to be the required range. The striking velocity (1380 f. s.) is also obtained by continuing the horizontal line.

GUNS FOR DESTROYERS.—In satisfying a laudable desire to have the best, we do not infrequently miss the fitness of a thing for a particular purpose. The man who made packing-cases of polished figured walnut was very obviously wasting a valuable material on a duty which could equally well have been performed by something cheaper. Glaring cases like that do not often present themselves, but we might find fairly close parallels without much exertion. The lack of fitness is, however, as a rule, less patent and more likely to escape detection. An interesting example which is exercising the minds of the more thoughtful naval officers may be found in the armament of torpedo-boat destroyers. Most of these vessels are armed with long 12-pounders, whilst the latest and largest carry 4-inch pieces precisely similar to the weapons carried by cruisers or battleships, and it is being asked if such guns are really the most suitable armament

Striking Velocity in Foot Seconds.
Striking Velocity in Foot Seconds.
Range in Yards.
12" GUN. M.V. 2750 f.s.
9.2" GUN. M.V. 2800 f.s.
7.5" GUN. M.V. 2800 f.s.
6" GUN. M.V. 2900 f.s.
12"
9.2"
7.5"
6"

for these vessels? It is pointed out that the destroyer is not intended to engage in long-range practice with cruisers or battleships, from which it should keep its distance; it is, on the other hand, expected to fight vessels of its own class at comparatively short range, and it is becoming every day more certain that a 3-inch shell is not large enough to stop vessels of such size as the new destroyers. Would it not then be better to reduce the length and weight of the present guns at the sacrifice of unnecessary muzzle-velocity, and put the weight gained into bigger bore? There is, clearly, much to be said on both sides of the question. The advantages of uniformity must be sacrificed if a special gun is got out for destroyers, and bigger bore means generally bulkier and heavier ammunition, which involves, if the number of rounds is not to be reduced, larger ammunition rooms and more weight to be carried. It is further contended that great range is valuable, at least in emergency, and ought not to be sacrificed. With such conflicting elements on both sides it is difficult to form a definite opinion, but many naval officers of experience are firm in the opinion that a 4-inch gun is required, and that by the adoption of a special design of reduced length, weight, and range, torpedo-boat destroyers might be better armed than they are at present.—*Engineer.*

NIGHT FIRING.—The question of night firing is, for the moment, closely engaging the attention of the Admiralty and senior officers of the navy, as it is recognized that the danger to our fleets from night attack by torpedo craft is very real. The suggestion has been put forward that a night-firing school for the navy should be established at some suitable and isolated spot on the coast of the United Kingdom, where a specially trained and expert staff should teach the gunlayers of the fleet how to shoot at night as well as they now shoot in daylight. Whether the foundation of such a school would have the desired effect or not, it is generally recognized that a big effort is necessary to improve night shooting in the navy, and bring it up to the same high standard of excellence that has been attained in day shooting. It is not improbable that the solution of the question may be found in another way, as it is understood that our naval gunnery experts are engaged in experiments which may lead to a sustained and effective fire at any period of the 24 hours, so long as the object is in sight. The battleship *Vengeance* has been fitted out for a series of experiments with some very clever inventions directed towards the above purpose, which, if successful, will also obviate the necessity of placing "spotters" and their fire-control apparatus in a position which makes them the first mark of an enemy bent on destroying our ships by first destroying the machinery for controlling our gun-fire, fitted up so elaborately and at such an enormous expense. The result of these experiments will be awaited with interest in gunnery circles.—*United Service Gazette.*

We have already in these columns asked why it is that, if the torpedo is supposed to have a value when supplied to our warships, it is not allowed to play its part in the battle practice of the fleet? In the United States Navy they have torpedo-layers' tests somewhat after the fashion of our gunlayers' test. That is apparently as far as they have got, and although we go a good deal further in practising our torpedo-layers we do not publish any results or give prizes, as we do for laying the guns. To a certain extent there can be no doubt that the result of the use of the torpedo in the recent war tended to lower this weapon in the estimation of the naval world. Morally, the damage done in the attack on the squadron off Port Arthur in the first engagement of the war was very great indeed, but all the ships were subsequently repaired, and relatively to the number of boats employed, the number of torpedoes fired, and the opportunity for the assailants, the outcome was not what had been expected Again, after the battle of August 10, as the Russian fleet was retreating

it was attacked by some two score of destroyers, but only one hit was scored; the *Poltava* was damaged, but was taken in tow and arrived safely. Similarly, in the battle of May 27, although all the ships attacked by the destroyers had previously been injured, and a great number of boats were employed, the result was insignificant compared with the effort made. The *Suvaroff* was already in a sinking condition when she was struck by two torpedoes, and sunk. The *Navarin* was hit four times by torpedoes before she foundered. The *Sissoi Veliki* was hit twice, and by some accounts three times, yet she was kept afloat a long time before she sank. Two other vessels are known to have been hit by torpedoes, the *Admiral Nakhimoff* and the *Vladimir Monomach*, but it is even now uncertain whether the injuries made by the torpedo sent them to the bottom. On the other hand, these results are not supported by those made at exercises by the European and American fleets under peace conditions. On several occasions our own destroyers have scored heavily, and similar reports have come from the United States fleet and also from that of Germany. And it is the general opinion that it would be a mistake to lay too much stress in regard to this matter upon what happened in the Russo-Japanese War.

There is another matter to be taken into account, and this is the great progress which has been made with the torpedo itself. The new weapons have a wider range, and make more accurate shooting, and are altogether more deadly than those used by Japan in the war. A range of 5000 yards, a speed of 36 knots, and a charge of over 300 pounds of explosive, these are all claimed for the improved torpedoes, which every nation is procuring. Then again enormous improvements have been made in the destroyers, particularly those of this country, and after all it is with the destroyer as a torpedo-carrier that we now have to reckon, its original purpose having almost disappeared. With destroyers of 33 knots and torpedoes of 36, and a determination to get well inside what may be called point-blank range, it is high time we looked to give our big ships an increased measure of security. Provided a fleet at sea is located by the enemy's destroyers, its protection must depend either upon a counter attack by its own boats or such means of defence as the ships are provided with in the shape of nets, searchlights, and guns. It is very doubtful indeed if the net will stop the latest type of torpedo, and therefore, it is that of late we have seen so much attention paid to the subject of night gunnery and after-dark battle practice. We have got down practically to one caliber of gun for daylight work, and the second battery will soon consist wholly of guns for repelling a night attack by destroyers. In the opinion of many the secondary battery of all the older ships, and some even include the *Dreadnought*, is inadequate for its purpose. But whatever guns are carried, if they are to be used effectively, the practice with them must be systematic and continuous.—*Army and Navy Gazette.*

AMMUNITION, MODEL OF 1906, FOR UNITED STATES MAGAZINE RIFLE, MODEL OF 1903.—The caliber .30 ball cartridge consists of the case, primer, charge of smokeless powder, and bullet. The case is of cartridge brass. It has a conical body joined by a sharper cone, called the shoulder, to the neck, which is the seat of the bullet, and very nearly cylindrical. The front end of the case is called the mouth, and the rear end the head. The head of the case is grooved to provide for extraction of the cartridge from the chamber of the rifle, and is provided with a primer pocket and vent. The initials of the place of manufacture, together with the number of the month and year of fabrication, are stamped on the head of the case.

The primer consists of the cup, percussion composition, disk of shellacked paper, and anvil. The cup is of gilding metal, and contains .48 of a grain of nonfulminate composition, composed of tersulphide of antimony, potassium chlorate, sulphur, and ground glass. A disk of shellacked paper covers the composition to protect it from moisture and to prevent elec-

trolytic action. The anvil is of brass, and is assembled over the paper. After the primer is seated in the case, a drop of shellac is placed on the head of the primer to make the joint waterproof.

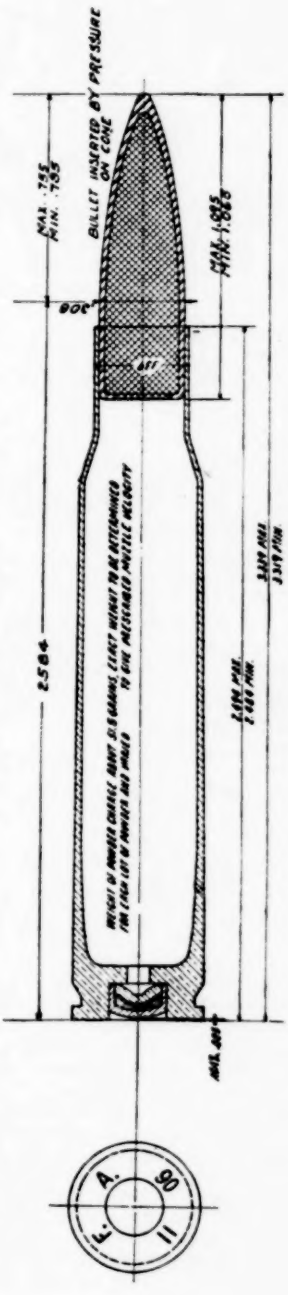
The charge is of pyrocellulose composition, very similar to the powder used as propelling charges in field and seacoast guns. The grains are cylindrical, single perforated, and graphited. The normal charge weighs from 50 to 52 grains.

The bullet has a core of lead and tin composition enclosed in a jacket of cupro-nickel. It weighs 150 grains, and the point is much sharper and offers less resistance to the air than that of any previous model in the United States service. The sides of the bullet are smooth, and its base flat. That portion of the sides of the bullet inclosed in the neck of the case is covered with a lubricant composed of Japan wax and graphite. A pressure of at least 75 pounds is required to seat the bullet in the case, resulting in the case being waterproof. The value of small c (the coefficient of air resistance) as determined for this bullet is .5893.

The standard muzzle velocity of this ammunition in the rifle is 2700 feet per second. The instrumental velocity measured at 78 feet from the muzzle, corresponding to the muzzle velocity, is 2640 feet per second, with an allowed mean variation of 20 feet per second on either side of the standard. The average chamber pressure is about 50,000 pounds per square inch.

The cartridge complete weighs about 392 grains, its weight varying slightly with variation in the weight of the powder charge.

Five cartridges are packed in a clip. The clip consists of the body and the spring, both of brass. On the exterior of the sides of the body are stop lugs, which seat the clip in its slots in the receiver of the rifle. The top edges of the slides are folded inward, forming flanges which, fitting into the grooves in the head, hold the cartridges in place. The spring is secured to the bottom of the body by two sets of interlocking lips. The ends of the springs are provided with narrow tongues which, when the clip is filled, are pressed into the grooves of the outside cartridges, holding the cartridges securely in place. The clip



CASE AND BULLET, MODEL OF 1906 AMMUNITION.

bodies can be used a number of times, but the tongues on the springs will stand resetting only once.

The clip for dummy cartridges has square instead of round ends, and the tongues on the spring are omitted.

Sixty ball cartridges, in 12 clips, are packed in a bandoleer. The bandoleer is made of olive drab cloth, and contains six pockets, each holding two clips. The mouth of each pocket is sewed up, but a piece of tape is sewed on in such a manner that by pulling on its end the seam is readily opened.

The bandoleer is provided with a shoulder strip of olive drab webbing by which it is carried over the shoulder, and a safety pin is provided to afford an adjustment of its length to suit the convenience of the soldier. The bandoleer with its cartridges weighs about 3.88 pounds. On each bandoleer is stamped the number and kind of cartridges, the place of manufacture, the instrumental velocity, and the date of loading.

Twelve hundred cartridges (in 20 bandoleers) are packed in an hermetically sealed zinc case, provided with one end of tin soldered to the case. By means of a brass handle on the cover the latter is easily torn off.

The zinc case is enclosed in a wooden box of outside dimensions of 34.5 by 9.5 by 8.27 inches, which weighs when filled about 99 pounds. One end is secured to the box by five brass bolts and can be easily removed without the use of tools. Two wire seals also connect the cover with the sides of the box. The date of loading of the contained cartridges is stamped on each end of the wooden box.

PENETRATION OF MODEL OF 1906 BULLET (2700 FOOT SECONDS) COMPARED WITH MODEL OF 1903 BULLET (2200 FOOT SECONDS).

Material.	Penetration. 50 feet.		100 yards.		500 yards.		1000 yards.	
	Model 1903 Ins.	Model 1906 Ins.	Model 1903 Ins.	Model 1906 Ins.	Model 1903 Ins.	Model 1906 Ins.	Model 1903 Ins.	Model 1906 Ins.
White pine boards, 1 5-16-inch thick, spaced one inch apart	41.5	†33.5	43.5	46.7	18.8?	24.3	13.4	12.8
Moist sand	9.0	8.7	...	...	15.6	13.4	13.5	12.5
Dry sand	6.0	4.0	...	...	13.4	9.2	11.7	7.5
Loam, practically free from sand	14.2	14.0	...	...	22.4	18.8	21.8	18.6
Low steel plates, .493 in. thick	.177	.446	.085	.259	...	...	...	...
.3843 in. thick	*	*	.374	*	...	...	...	...
.3062 in. thick	*	*	*	*	...	...	...	...
High steel plates, .3848 in. thick	.065	*	.021	.341	...	...	...	...
.1962 in. thick	*	*	*	*	...	...	...	...
Thoroughly seasoned oak across the grain	27.6	12.2	26.3	33.6	...	...	...	...
Brick wall	...	...	3.0	5.0	...	...	...	...

* Through.

† Two bullets keyholed at fifth board, penetrating 12.0 and 15.9 inches respectively. Mean penetration of remaining three bullets 46.4 inches.

The penetrations given in the table are means of five shots. The penetrations at 1000 yards were made at 28 feet for the model of 1903 ammunition, and at 53 feet for the model of 1906 ammunition, the velocities at these points being the calculated remaining velocities at 1000 yards.

—*Arms and the Man.*

COOLING MAGAZINES.—Admiralty orders have been received at Portsmouth to proceed as expeditiously as possible with the work of fitting refrigerators to warships for the purpose of keeping down the temperature in the magazines. The work has been ordered as the outcome of the terrible experience of the French Navy in the explosion on board the battleship *Iéna*. The British vessels are being taken in hand one after the other, and the apparatus is to be fitted with all speed. Owing, however, to the special requirements as to the character of the insulation required, the sub-division of the cooling system, and other important considerations, progress is bound to be slower than when every detail has been satisfactorily settled. A grant of £20,000 was originally made by the Admiralty for the purpose, and additional grants have since been made.—*United Service Gazette.*

MARINE TURBINES AND GAS ENGINES.

LIQUID FUEL FOR INTERNAL COMBUSTION ENGINES.—Since the gas engine was a commercial machine, the advantage of the use of a liquid fuel for driving this type of engine became apparent, and at the present time these advantages have become so enormous that there is quite a likelihood of the liquid fuel internal combustion engine superseding a large proportion of the steam units now in use. Manufacturers are designing and building these engines in constantly increasing sizes, and it is, perhaps, still a debatable point whether large marine engines of this type can be successfully used or not.

Liquid fuels must not be considered solely as the products of petroleum, because the control of that market is in the hands of a very few large companies. It is necessary to have one or more alternative fuels, in order that purchases of fuel can be made in an open market. It is, therefore, essential that engines designed for liquid fuel should be capable of being run on these alternative fuels without material alterations in their gear. The manufacture of a national fuel, as distinct from an import from foreign countries, should receive every encouragement, as such a fuel could not be a monopoly, and it is reasonable to expect that its price would be maintained at a steady and low figure.

We have recently seen how a great and concerted effort to encourage the use of alternative fuels has had the effect of reducing the price of a petroleum product, which points to the fact that at the present time the prices demanded by the large oil companies are false ones.

ATTEMPTS TO UTILIZE THE HEAVIER OIL.

In order to successfully utilize a liquid in the form of oil in the cylinder of an internal combustion engine, two distinct methods have been tried to cope with the difficulties present. The fuel can be introduced:

1. As oil, *without* chemical change, either in an atomized or partly vaporized and partly atomized form.

2. *With* chemical change, such that the oil before entering the cylinder has been wholly or partially decomposed into the lighter hydro-carbons.

In the first group may be classed the first commercially successful engine, the Priestman, although in its effect it borders on case two. Distinct from this type is the Diesel engine, which works by compressing the air alone up to about 700 pounds per square inch. Into this highly compressed air at the end of the inward stroke of the piston, is injected the correct proportion of liquid fuel, by means of air at a higher pressure operating a jet. As this fuel enters the cylinder it burns spontaneously, without a sudden rise of temperature, throughout a greater part of the working stroke.

Finally, there is the Roots type of engine, which has the low or ordinary compression of about 70 pounds per square inch, in which each charge of

oil is accurately measured, and injected into the engine cylinder during the suction stroke, and in which chiefly atomization is relied upon to produce proper carburation of the air in the cylinder.

Under type 2 come all engines having externally heated vaporizers, in which the liquid fuel is first converted, by partial decomposition, into a gaseous or semi-gaseous state before its introduction into the engine cylinder. A chemical change takes place in this vaporizer, and there is always the likelihood of deposits of carbon or heavy residuals forming here. Any possible variation in temperature between the vaporizer and the induction pipe will cause the vapor to condense in the pipe or round the inlet valve before it reaches the engine.

THE SOURCES OF SUPPLY AND THE QUESTION OF PRICE.

As far as we in this country are concerned at the present time, the United States of America can be almost ignored as a source of supply for the petroleum fuels. Originally, practically all the lighter distillates of petroleum imported into this country were obtained from the Pennsylvanian fields, as there was only a small percentage of petrol in the Russian oil, our other source of petroleum at that time.

Now the home consumption of American spirit has reached such proportions, together with the depletion of the wells in that country, that the amount available for export is very small. Whereas in 1905 we imported 10½ million gallons of petroleum spirit from America out of a total of 18½ million gallons, this importation had fallen to 2½ million gallons for the first six months of 1907, a decrease to less than 20 per cent of the total amount imported.

The great increase in the demand for petroleum spirit in this country is shown by the following figures supplied by Mr. Alexander Duckham:

Year	1904	11,972,000	imperial gallons.
"	1905	18,658,000	" "
"	1906	26,792,000	" "

and the percentages of imports from the different sources have been as follows:

Country.	1904. Per cent.	1905. Per cent.	1906. Per cent.
United States	50	56	29.8
East Indian group	37	42	61.4
Roumania	8.2	0	8.6
Other Countries	4.8	2	0.2
	100	100	100

These figures show the change in the sources of supply during the last few years, which change is still more marked for 1907.

Russian oil contains practically none of the lighter fractions which have been used in the past for motor spirit. Also the labor disturbances in Russia account for its absence from the above list.

Roumania, on the other hand, does a large export trade in spirit, the bulk of which goes to France and Germany.

Roumanian Spirit obtained, in Gallons.

1903	14,500,000
1904	18,600,000
1905	23,500,000

The bulk of the spirit now coming into this country is from the fields of Sumatra, Borneo, and the East Indies, and it is only within the last few years that the companies operating these fields have exported their light products to Europe. The oil from these fields contains a large percentage, up to 20 per cent of a spirit distilling between 60° C. and 150° C., and referred to by the author as Borneo spirit, and also a considerable quan-

tity of the more familiar Shell spirit, having a sp. gr. of 0.715 to 0.720. The amount of spirit available from these fields depends upon the market for kerosene and other residuals. Sir Marcus Samuel in a recent speech stated that although they could produce an enormous quantity of spirit, "the price would depend upon whether they could find remunerative markets for the other products left when the petrol was removed from the crude."

As these products constitute something like 90 per cent of the total, there is very little assurance that the petrol market will continue in a stable condition for any length of time. The price obtained for the residuals is primarily governed by the price of coal; for instance, Russia at the present time utilizes the bulk of its production locally as fuel oil. It would not pay to distil this oil for the sake of a small percentage of petrol. The removal of the specific gravity standard might make the necessary difference, as far as Russia is concerned, whether it would pay to distil or not.

Considering the East Indian oil, in addition to the demand for fuel oil, which is very small, the chief marketable residual is kerosene. The companies, however, find this market decreasing year by year.

FLUCTUATIONS IN THE PRICE OF PETROLEUM.

As compared with other fuels petroleum products show unaccountable fluctuations. This is undoubtedly due to the fact that the control of supplies is in very few hands. It is, therefore, an easy matter to create artificial prices, which must be paid by the consumer. Users of liquid fuels of the heavier types know how difficult it becomes to enter into any sort of contract for supplies, and that when sums of money have been expended in fixing apparatus for burning heavy liquid fuels, the price of such a fuel is raised until no economy results in return for the change.

As regards the lighter fractions, some idea of the fluctuation in price can be gathered from the following list of prices to agents in London, for spirit delivered in cans and cases:

November, 1904	7*d.*
November 20, 1905	8*d.*
January 19, 1906	9*d.*
February 21, 1906	9½*d.*
May 3, 1906	10*d.*
August 2, 1906	12*d.*
December 24, 1906	13*d.*
July 26, 1907	12*d.*

The final reduction of one penny occurred simultaneously with the issue of the report of the Fuels Committee of the Motor Union.

This serious rise in price has proved almost disastrous to users of commercial and public vehicles, particularly motor omnibuses, in connection with which the margin of profit is so small. The larger companies have contracted for supplies at a low figure, but the early contracts are now expiring. All the later contracts have been made at higher figures, and whilst the earnings remain the same, the profits must decrease.

This all points to the necessity of healthy competition in the fuel market, and several alternative fuels have been suggested for use in a high speed internal combustion engine.

When we look for a substitute for petrol, a home produced fuel, which can be utilized without in any way altering the existing arrangements of the engine or carburetter, undoubtedly holds out great hopes. Such a fuel, known as benzol, is a distillate of coal tar, or can be extracted from coal gas. It is a light hydro-carbon, C_6H_6, and is a clear liquid similar in appearance to petrol, but having a slight smell of sulphur, due to the presence of about 150 grains of sulphur compounds per gallon. The specific gravity of pure benzol is 0.885; boiling point, 80° C., or 176° F.

Total evaporation point of crude benzol is 145° C. or 293° F., and 1 gallon contains 163,680 British thermal units of heat, as against 157,142 B. T. U. for petrol, and has an explosive range from 2.7 to 6.3 per cent.

The largest source of supply is from coke ovens or gas works.

In the modern systems of coke manufacture for iron smelting the by-products obtained in the distillation of coal are collected instead of being allowed to go to waste, as in the old style of beehive oven. The benzol obtained in the gases from distillation is readily absorbed by means of suitable oils, from which it is afterwards extracted by distillation.

Commercial "90 per cent benzol" is a spirit of which 90 per cent evaporates in a retort at a temperature of 120 degrees C., and the production of which amounts to about 5,000,000 gallons per annum in this country. This supply could be largely increased by the installation of suitable recovery plant, should the demand warrant the expenditure. The supply could thus be doubled within a very short time. The present price of this fuel when refined is about 9d. to 10d. per gallon at the makers' works, the process of refining and washing costing about 1d. to 2d. a gallon. The process of washing by means of sulphuric acid and soda partially eliminates the sulphur compounds, but unwashed benzol might be made suitable for motor car work by distilling out the lighter portions, and with them the bulk of the impurities.

EXPERIMENTS WITH 90 PER CENT BENZOL.

With regard to the use of 90 per cent benzol as a motor fuel, the author has made a number of experiments, the results of some of which are given below, and can be compared with those for petrol of various densities.

	Miles per Gallon.	Distance.	$\frac{EV^2}{C \times 100}$	Y
	Long Test.			
Benzol, sp. gr. 0.875	27.2	116 miles	14.8	1
	Short Tests.			
" "	24	14 miles	12.25	in traffic.
" "	22	15 "	12.4	"

The distances travelled per gallon compare very favorably with the best results obtain with petrol, viz.:

0.715 sp. gr., 18 miles per gallon.
0.760 " 21.5 "

The engine pulled well, and the speed of the car was kept about the same as when using petrol.

The author finds that on some occasions it is advisable to use rather a larger jet with benzol than with petrol, but care must be taken to admit sufficient air, or sooting takes place inside the cylinder. The smell of the liquid in the unburnt state is slightly more noticeable in the case of benzol, but the exhaust gases have little smell and no tendency to smoke.

In spite of what has been said against alcohol as a motor fuel, it is the author's opinion that alcohol has great possibilities in this direction. A clear statement is given in the report dated July, 1907, of the Fuels Committee of the Motor Union as to the requirements and behavior of this fuel and to the high compression necessary to obtain the best results.

ALCOHOL AS A FUEL.

The author has obtained samples of commercial methylated alcohol having a sp. gr. of 0.833, and with them conducted a number of tests, using other ingredients in varying proportions. He has succeeded in running his motor car satisfactorily upon these mixtures and also with alcohol mixed with only 25 per cent of another fuel.

The fact is here stated in order to refute many biased opinions which have been expressed of late as to the impracticability of alcohol as a fuel

for this purpose. Sir Marcus Samuel, in the speech previously referred to, remarked with referenc to alcohol: "Although alcohol might prove an excellent bogey with which to attempt to frighten the producers of petrol, they did not entertain the smallest misgiving that this spirit could ever become a competitor to their petrol, for the simple reason that it did not contain those qualities essential for the running of motor vehicles."

Considering now these essential qualities, the properties of alcohol may be briefly summarized as follows: ethyl alcohol C_2H_6O, a volatile colorless liquid with a specific gravity of 0.806 at O degree C. Calorific value about 12,600 B. T. U. per pound. Boiling point 78° C. Explosive range 4 to 13.6 per cent with air.

Methylated spirit, consisting of 90 per cent ethyl alcohol and 10 per cent methyl alcohol (CH_4O), has a calorific value of about 11,000 B. T. U. per pound.

The following is an approximate comparison:

	Petrol 0.722.	Methylated spirit.
Calorific value in B. T. U. per pound....	20,000 (gross)	11,000 (gross)
Net calorific value per pound, *i. e.*, heat converted into work.....	4248 B. T. U.	3322 B. T. U.
Thermal efficiency = Heat converted into work = Calorific value	21 per cent.	30 per cent. .....

In practice, a petrol motor rarely exceeds a thermal efficiency of 18 per cent, whilst with an alcohol motor the highest efficiency is readily obtained, and, considering that a gallon of alcohol weighs about 12 per cent more than that of petrol, the net value per unit volume is about the same. A great advantage of alcohol is its uniformity of composition, the whole of the spirit distilling over at a temperature of about 78° C.—R. W. A. BREWER in *Page's Weekly*.

IF LUSITANIA BURNED OIL.—Engineer Kermods, who recently conducted oil fuel experiments on behalf of the Admiralty, says that if the *Lusitania* were fitted to burn oil she would need only 27 stokers, instead of 312. She could carry 250 more passengers and 4000 tons more cargo and reduce her time of crossing the Atlantic eight hours.—*New York Sun*.

RADIO TELEGRAPHY.

THE POULSEN ARC.—In a lecture delivered by Count Arco to the German Association of Naval Architects, on November 26 last, it was stated that the practical difficulties experienced in producing electrical oscillations by an arc-lamp had been overcome by the Gesellschaft für Drahtlose Telegraphie. The new arc oscillator, once started, will continue, it is claimed, to work steadily for hours without requiring attention. It absorbs 6 kilowatts, and has been largely used of late by Count Arco for wireless telephony. The first successful demonstration of this latter art took place in December last, the distance covered being 36 kilometers. The receiving apparatus was coupled to a mast 328 feet high. With the improvements since effected wireless telephony is practicable over a similar distance using masts only 55 feet high. Last month, using masts 86 feet high, excellent speech was maintained over a distance of 75 kilometers. In spite of the success above exemplified, Count Arco in his lecture expressed a doubt as to whether the arc oscillator would come into general use for wireless telegraphy, the expenditure of energy being much greater than when a spark oscillator was used. With the latter, using masts but 40 feet high, it is possible to telegraph over a distance of 75 kilometers, expending energy at the rate of 200 watts only.—*Engineering*.

MISCELLANEOUS.

COULD ADMIRAL SAMPSON HAVE TAKEN HAVANA?

A review of Colonel H. H. Sargent's "Campaign of Santiago de Cuba" appears in the January number of the *Bluejacket*, signed, ***Nauticus***. The following, respecting Admiral Sampson's proposal to attack Havana immediately upon the declaration of war, is of special interest to naval officers. The reviewer says:

"Colonel Sargent condemns the proposed attack upon Havana, to take place immediately upon the declaration of war, as "of course, utterly impossible" (I.175) to succeed. The reviewer disagrees entirely with this judgment. The author is mistaken (though this is a small matter so far as it bears upon the question of Sampson's success) as to the number of guns available for defense, at the time, for the Havana batteries were not in April what they were in August, and he is mistaken in his estimate of power as they finally stood. He (I.81 *et seq.*) fails to differentiate the armament sufficiently to give a clear idea of what these defenses were composed. For example he mentions La Fuerza as "armed with four 11-inch rifles"; making no remark which would not lead the usual reader to suppose that these were four powerful guns, well placed for defense. These guns in fact were iron muzzle-loaders and the army inventory made for the use of the Evacuation Commission says of La Fuerza "The guns and defenses are of no value," and of the guns as having "a limited field of fire directly opposite the fortress in which they are mounted." This small work (improperly called a "fortress" in the report) was on the entrance channel, half a mile from the mouth and commanding nothing but the part of the channel opposite itself. Numerous old bronze guns of the 18th century, rifled with three heavy grooves, and practically as innocuous as pop-guns in such a defense, are spoken of as 6.2-inch rifles, without qualification. The report of the army Chief of Ordnance, 1889, p. 525, gives the total number of cannon of modern pattern at Havana as twenty-four B. L. R., cal. 6 to 12-inches; six Maxim-Nordenfelt rapid-fire guns, caliber 2.224 and eight B. L. R., caliber 8.27. Of course there were others which were serviceable to some degree, but in no wise to be reckoned as part of a modern armament.

"In the reviewer's opinion, leaving aside all questions but that of feasibility, Sampson would have taken Havana, April 23, had he been allowed to act, and he would have done this without damage to his squadron or without serious, if any, loss. Sampson's intention was as follows: to begin with the west and destroy or silence the batteries in succession; a not difficult task as the reviewer hopes to show. To begin with, the eastern batteries (including the Morro) were powerless, the only heavy gun there which had a train south of west (a Krupp 12-inch, in battery No. 2, a mile east of the Morro), was entirely avoidable by skirting close to the shore, as Sampson proposed. There were in battery No. 2 two 8-inch howitzers, which might have given annoyance, but the battery was not yet in readiness for action. The same in fact may be said of the whole; the only guns as yet actually tried were the 12-inch of Santa Clara. The squadron would thus have met wholly untrained crews. But crews trained or untrained, the lay of the land is such that each battery could have been taken from the southwest and west in flank at short range and destroyed without its being able to return a shot. Chorrera was thus situated at a range of 1400 yards; battery No. 4 at 2000; battery No. 3 at 1200 or less, and Santa Clara, the most powerful of all, at 1800 yards. The ships' guns would have looked down into all these batteries but Santa Clara, as, excepting the last, no one of them had an elevation exceeding 7½ feet above the sea (2.2 meters: Nunez, an artillery officer at Havana, in *La Guerra Hispano-Americana; La Havana*, 54). Santa Clara was 46 feet (14.4 meters) above the sea, and thus more difficult; but at short range of less than a mile, it is reasonable to suppose that a continued and

deliberate fire with the ships anchored, if so desired (the more westerly batteries being silenced or destroyed) would have caused it to share the fate of the others. The problem was very different to that presented by the loftily situated batteries of San Juan and Santiago.

"After the reduction of these batteries, it was open to Sampson to anchor in the deep bight southwest of the Morro (the two rifles of La Punta could not bear and would have been made short work of), with his guns at shortest range, looking directly up the city's streets. There is not space to discuss the probability of what might have followed, but the very large chance is that he would have been at anchor in the harbor by evening of that day. In any case Havana would no longer have been a fortified place, and we should still have had an intact squadron.

"However fearless was Sampson, his courage was that of the perfectly brave man who has measured the danger. He was not rash; a cooler, clearer-headed commander is not known either to the reviewer's experience or in his reading of history. He simply measured the situation and his antagonists accurately.

"It should be recognized (let one use the charts of the Havana batteries, showing the arcs of fire, prepared for the Evacuation Commission) that if it had later become a question of destructive bombardment, Havana, at any time, was at the mercy of the American fleet. The center of the city could be reached with ease by its guns from a position southwest of Chorrera Bay. The distance thence to the Prado was but 7000 yards across a plain which offered no obstacle, and with no guns to annoy except possibly the four 8-inch howitzers of battery No. 3 and the two similar of Santa Clara, but these could have been promptly disposed of under the enfilading conditions mentioned. Success in the attack proposed by Sampson seemed so certain, and was so certain, as a close study of the situation will show any one, that he gave it up with great reluctance and only upon the absolute orders of the Navy Department."

Nauticus also disagrees entirely with Colonel Sargent as to the movement on San Juan, and as to his views regarding Sampson's wish to take the batteries at the Santiago entrance in the beginning and go in with his squadron. Colonel Sargent says: "There can be no question but that a division of General Shafter's army into two parts and an attack upon both sides of the entrance to the harbor would have been a fatal mistake." *Nauticus* shows how the 1000 marines available, combined with Garcia's forces, would have been ample for the west, and that in fact Shafter did divide his forces to a much greater extent than would have been necessary for the eastern side by sending 6000 men to make what the reviewer calls "the altogether unnecessary and most inconsiderate attack upon El Caney," which is as distant from Santiago city as is the Morro.

The reviewer, in the February number of the *Bluejacket*, in correcting the number of Escario's forces arriving at Santiago to 3300 from the 1300 in the January number, points out that Colonel Sargent's view that Linares should have met the American army with his whole available force, say 9000 men, at Las Guasimas, is a mistaken one, inasmuch as such a body could not have been held in position, exposed to the fire of the whole American fleet, as they would have been, on a plateau but a mile and a half from the sea; that in fact the stand could not even have been made at San Juan hill, had information of the situation been sent Sampson, with a request to shell the position. The distance from the ships was but 8000 yards, an easy range for the 8, 12, and 13-inch guns of the ships.

The *Neue Militärische Blätter* publishes tables giving the comparison of the strength of the *personnel* of the navies of Great Britain, Germany, France, Italy, and Japan:

Great Britain: 128,460 men, out of which 2978 are ships' officers, 1146 engineers, 529 surgeons, 631 paymasters, 176 chaplains, and 1397 midshipmen and cadets. Germany: 1545 ships' officers, 293 engineers, 234 sur-

geons, 189 paymasters, 21 chaplains, 553 cadets, 149 technical officers, 39,385 under-officers and men, or altogether 42,369 men, to which must be added 1279 marine infantry, 3265 marine artillery; grand total, 46,913; during this year these numbers will be increased to 50,000 men. France: 56,800 men, of whom 1769 are naval officers and 396 engineers. Italy: 28,500 men, of whom 970 are officers and 262 engineers. Japan: 1623 ships' officers, 446 engineers, 285 surgeons, 225 paymasters, 600 cadets; altogether 39,712 men.—*United Service Gazette.*

BRITISH AND FOREIGN DREADNOUGHTS.—The following is the Navy League's Table of Naval Strength of Principal Maritime Powers, showing in detail *Dreadnoughts* built, building, and projected:

Great Britain (Contract time of building 24 months).

Name.	Displacement, Tons.	Laid Down.	Completed.
Agamemnon	16,500	May, 1905	Nov., 1907*
Lord Nelson	16,500	May, 1905	Dec., 1907*
Dreadnought	17,900	Oct., 1905	Oct., 1906†
Indomitable	17,250	Mar., 1906	Feb., 1908†
Inflexible	17,250	Apr., 1906	Mar., 1908†
Invincible	17,250	Apr., 1906	Apr., 1908†
Bellerophon	18,600	Dec., 1906	Dec., 1908‡
Téméraire	18,600	Jan., 1907	Jan., 1909‡
Superb	18,600	Feb., 1907	Feb., 1909‡
St. Vincent	19,250	Dec., 1907	Dec., 1909§
Collingwood	19,250	Jan., 1908	Jan., 1910§
Rodney	19,250	Feb., 1908	Feb., 1910§
Anson	19,250	Nov., 1908	Nov., 1910‖
New Invincible	17,250	Nov., 1908	Nov., 1910‖

* 1904 Naval program. † 1905 Naval program.
‡ 1906 Naval program. §1907 Naval program.
‖ 1908 Naval program (supposition only, as stated in the *Times*).

Germany (Contract time of building 36 months).

E. *Bayern*	17,710	Aug., 1907	Aug., 1910*
E. *Sachsen*	17,710	Aug., 1907	Aug., 1910*
E. *Baden*	19,000	Nov., 1907	Nov., 1910†
E. *Würtemberg*	19,000	Nov., 1907	Nov., 1910†
F. Cruiser	18,900	Nov., 1907	Nov., 1910†
.....	.....	.....	.....
E. *Oldenburg*	19,000	July, 1908	July, 1911‡
E. *Siegfried*	19,000	July, 1908	July, 1911‡
E. *Beowulf*	19,000	July, 1908	July, 1911‡
G. Cruiser	18,900	July, 1908	July, 1911‡
H. Cruiser	18,900	July, 1909	July, 1912§
E. *Frithjof*	19,000	July, 1909	July, 1912§
E. *Heimdall*	19,000	July, 1909	July, 1912§
E. *Hagen*	19,000	July, 1909	July, 1912§

* 1906 Naval program. † 1907 Naval program.
‡ 1908 Naval program. § 1909 Naval program.

France (Contract dates of completion given).

Danton	18,027	Dec., 1906	Jan., 1911*
Mirabeau	18,027	Dec., 1906	Jan., 1911*
Voltaire	18,027	June, 1907	July 1911*
Vergniaud	18,027	Sept., 1907	July, 1911*
Diderot	18,027	?	July, 1912*
Condorcet	18,027	?	July, 1912*

* 1906 Naval program.

U. S. America (Contract time 36 months).

Michigan	16,000	Autumn, 1906	Nov., 1909*
South Carolina	16,000	Autumn, 1906	Nov., 1909*
New York	20,000	Nov., 1907	Nov., 1910†
Delaware	20,000	Nov., 1907	Nov., 1910†
Projected	25,000‡	—	—
Projected	25,000‡	—	—
Projected	25,000‡	—	—
Projected	25,000‡	—	—

* Authorized 1905. † Authorized May, 1907.
‡ Proposed 1908 Naval program.

Japan (Allies until 1915 against two Powers).

Satsuma	19,250	May, 1905	Jan., 1908
Aki	19,780	Mar., 1905	May, 1908
A. Battleship	22,000	Dec., 1907	July, 1910*
B. Battleship	22,000	Dec., 1907	July, 1910*
A. Cruiser	18,650	Dec., 1907	July, 1910*
C. Battleship	22,000	Summer, 1908	Feb., 1911
B. Cruiser	18,650	Spring, 1908	Mar., 1911
C. Cruiser	18,650	Projected, 1908	? 1911

* May be completed by January, 1910.

NOTES.

Great Britain.—First nine mentioned are all afloat. Except two Japanese none other in entire list has been launched; *Bellerophon* and *Téméraire* have all their armor fixed already. Only those above the dotted lines can come into comparison with the British ships named. British programs to meet those below the line are not known.

Germany.—E. Cruiser 14,760 tons, 8 11-inch, not included. Our three *Minotaurs* are quite equal to it. *E. Baden, E. Würtemberg,* and F. Cruiser had not been laid down in December, 1907, but proposed dates for commencement and completion have not been altered in spite of this. Even reducing the building period to 30 months (never yet done, and the contracts are for 36 months), we still lead over two Powers.

France.—Though dates of completion have remained constant, the dates for commencing building are already in four cases many months passed. The usual period for building is five to seven years. The program to be brought forward in 1909 need not be considered.

U. S. America.—Delaware and *New York* not yet laid down, but proposed dates given in spite of this. Contract to firms is for completion in 36 months.

Thus, including Japan, our ally, the four next strongest Powers will combined have exactly as many large warships complete (battleships and armored cruisers) as shall we at the close of 1910.

After the above, Germany will have no battleships larger than 13,200 tons.

Germany, total 20.—10 *Deutschland,* 13,200 tons; 5 *Wittelsbach,* 11,643 tons; 5 *Kaiser,* 10,973 tons.

We shall have, total 38.—8 *King Edward,* 16,350 tons; 8 *Formidable,* 15,000 tons; 9 *Majestic,* 14,900 tons; 5 *Duncan,* 14,000 tons; 6 *Canopus,* 12,950 tons; 2 *Triumph,* 11,800 tons.

Armored cruisers.—Germany, 9; Great Britain, 35; plus certain projected new vessels armed only with 9.2-inch weapons, to be commenced next year.—*Army and Navy Gazette.*

THE HEALTH OF THE BRITISH NAVY.—The statistical report of the health of the navy for 1906 has just been issued by the Admiralty.

The total force, corrected for time, in the year 1906, was 108,190, and the total number of cases of disease and injury entered on the sick list was 77,842, which is in the ratio of 719.49 per 1000, being a decrease of 119.3 per 1000, as compared with the average ratio of the last nine years. The number of entries per man for disease and injuries was—on the Home Station, .69; Channel, .59; Atlantic, .76; Mediterranean, .67; North America and West Indies, with Particular Service Squadron, .91; China, .95; East Indies, 1.05; Australia, .86; Cape of Good Hope, .74; and the Irregular List, .92. In the total force the average is .71, a fractional decrease in comparison with 1905. The average number of men sick daily was 3144.77, giving a ratio of 29.06 per 1000, and showing a decrease of 6.00 in comparison with the previous nine years' average. The total number of days' sickness on board and in hospital was 1,147,843, which represents an average loss of service of 10.6 days for each person, which is a decrease of 2.19 in comparison with the average for the previous nine years.

The total number of persons invalided was 2436, which is in the ratio of 22.51 per 1000, and shows a decrease of 5.73 per 1000 in comparison with the average of the previous nine years. Of the above total, 1721 persons were finally invalided from the Service (78 of whom refused surgical operations), giving a ratio of 15.9 per 1000 for the whole force, or 70.65 per cent of the number invalided, thus showing an increase of .42 per 1000 when contrasted with 1905. Including Marines invalided from headquarters, the total number invalided out of the Service was 1901. Of the 2436 invalided, 2268 were invalided for disease, giving a ratio of 20.96 per 1000; and 168 were invalided for injury, giving a ratio of 1.55 per 1000. In comparison with 1905, the Home Station, Atlantic, North America, China, and the Irregular List show increased invaliding ratios; while the Channel, Mediterranean, East Indies, Australia, and Cape of Good Hope show decreases. The total number of deaths was 399, giving a ratio of 3.68 per 1000, which shows a decrease of 1.46 per 1000, in comparison with the average ratio for the previous nine years. Of this number 269, a ratio of 2.48 per 1000, were from disease, and 130, a ratio of 1.2 per 1000, from injury. Compared with the death ratios for last year, Atlantic, North America, Australia, and Cape of Good Hope show an increase, the remaining stations a decreased ratio. Nine persons committed suicide during the year.

Some curious facts are brought to light in this report, one being the case of a man invalided from retinitis, due to tobacco poisoning, and another that of a sick berth attendant poisoned by opium, to which drug he had become addicted. A fracture of a thigh is reported from the *Vengeance*, as occurring to a man when pulling off his sea-boot. No very definite reason could be found for this unusual accident. In another instance a curious result of an old injury in action is reported from the *Cornwallis*. A chief petty officer, who had been wounded in the River Gambia in 1892, complained of pain in the left popliteal space, where an abscess formed and burst. On examination a slug, about the size of a French bean, was extracted from the sac of the abscess, which had evidently become encysted in this position, and caused no inconvenience for 14 years. Mediterranean fever figures largely in the report, and is responsible for an important array of figures, but the labors of the Mediterranean Fever Commission may be said to have pretty conclusively established the fact that the use of infected goats' milk has been the direct cause of the great majority of attacks of this disease, and the reduction in the ratio which is shown in the report, is probably largely due to the steps since taken at Malta to avoid this source of infection.

Although there is a general decline in the ratio of nearly all other diseases, there is a regrettable increase in the case of venereal diseases; in

fact, it is most discouraging to find that the enormous amount of sickness in the navy, from these diseases, shows very little sign of any diminution as years go on. A slight fluctuation is noticed year by year, but the ratio for the year under notice is practically identical with the average ratio of the preceding nine years. Nearly all other diseases show a pretty steady yearly decrease; these remain in *statu quo*, Australia showing the highest ratio. While this is a matter for sincere regret, it is pleasant to find that alcoholism claims but very few victims in the fleet, a total of only 108 cases being reported, giving three invalidings and three deaths. Of beriberi, that strange disease which afflicted the Japanese Army in their war with Russia, 20 cases are recorded, with four deaths; all the 20 cases occurred among Lascars. The origin of the cases could not be traced, but it is noticeable that after the stock of rice on board had been destroyed and a fresh stock obtained, no more cases occurred. Curiously enough, the disease among the Japanese was attributed to the eating of bad rice, and diminished considerably when rice of a better quality was substituted.—*United Service Gazette.*

OIL FUEL FOR TRANS-ATLANTIC STEAMERS.—A writer in *Engineering*, summing up the advantages of oil fuel as applied to large trans-Atlantic steamers, says: It might interest many of the readers of *Engineering* to consider what effect the use of oil fuel would have upon the speed of the *Lusitania*. The following would be among some of the benefits derived from its use:

No smoke, the 192 stokers and 120 coal-trimmers would be left ashore, and 27 intelligent men of the greaser class would be employed to attend the oil-burners and regulate the water feed to the boilers. One water-attendant and one burner-tender per stoke-hole per watch would meet all needs. There would be available accommodations for, say, a further 250 third-class passengers. Some 600 tons of oil fuel per day would accomplish more than the 1000 tons of coal per day now used, and 2000 tons less fuel would be necessary per trip from land to land.

Presumably the *Lusitania* carries coal for the double trip, "out and home," and in that case 4000 tons less fuel might be carried if oil were used, and the cubic space representing this saving of weight could be utilized for merchandise, and for the earning of dividends. This is on the assumption that the vessel utilize her present bunkers for oil fuel; but, as a matter of fact, the oil fuel could be carried in the double bottom, and serve as ballast, and on one compartment being emptied of oil fuel sea-water could be admitted to preserve the trim of ship if it was desirable. In this event the whole of the existing bunkers would be made available for cargo.

When coal is used for fuel the fires become clinkered up periodically, and there is also the inevitable deposition of soot in the boiler tubes. The *Lusitania* has 192 fires to produce 68,000 indicated horsepower, and on the assumption (a very fair one) that 32 fires are cleaned every watch (say 12 hours after leaving Queenstown), it will be seen that about 10,000 indicated horsepower is lost every four hours through the operation of burning down and cleaning fires alone.

It is difficult to find regular stoking where so many men are employed, some of whom may be sadly inefficient as stokers. Irregular stoking will account in some cases for as much as 10 per cent loss of steam throughout the whole voyage, and added to this there is the steady lowering of the efficiency of the boilers through the deposition of the soot in the boiler tubes.

Liquid fuel and automatic stoking would ensure steady steam (that is, steady rate of progression) from land to land. The efficiency of the boilers would be unimpaired, because always in a state of cleanliness. From an approximate estimate of the several factors which go to determine a speedy voyage, it is safe to say that the use of oil fuel would diminish the time

necessary to accomplish the voyage by eight hours. Other factors for the shipowners' consideration are as follows:

It takes 35 men 2½ hours to put 80 tons of coal on board a liner from lighters. As against this, a steam-pump can put 300 tons of liquid-fuel aboard in one hour, silently and cleanly.

The whole army of lightermen, coal-heavers, firemen, and coal-trimmers, who are at present the bane of an engineer's life, would be dispensed with for sea-going purposes, and they would find more congenial employment under better conditions of life as "longshore men," handling the extra cargo on every voyage.

The use of oil-fuel for industrial process furnaces is invaluable, as temperature is strictly governed, and oil-fuel will accomplish more than thrice the amount of coal, pound for pound. Crude petroleum, water-gas tar, creosote, the by-product from gas-producer plants, and nearly all hydrocarbons may be used with perfect success. I have used all of these with the exception of the latter, but I am about to erect a plant to deal with that now.—*Nautical Gazette.*

OIL FUEL REGULATION.—An Admiralty order has been issued, in consequence of the fatal fire which occurred on board the destroyer *Spiteful* on August 5 last. The outbreak was caused by the escape of hot oil under pressure into the stokehold, due to the fact that a union joint nut on the oil supply pipe to a burner was disconnected at the time the oil was turned on. The Admiralty have, therefore, directed that the following special precautions are to be taken in order to prevent the recurrence of such an accident:

(1) In vessels fitted with oil fuel installations the whole of the oil system between the pumps and the sprayer spindles should on all occasions after overhaul, before the oil is heated, and before lighting up, be put under the *maximum* working oil pressure by means of the pumps, in order that any leakage may be detected.

(2) When a sprayer is lighted the oil supply should always be turned on gradually. A sprayer should never be left in place disconnected, and if it is removed for any length of time a screwed plug should be inserted in the union at the end of the supply pipe.

(3) Should a leakage of oil occur at any time, immediate action is to be taken to shut off the oil supply by means of the stop-valves provided, and to stop the oil pump. Engineer officers are to impress upon their staff the importance of this action, and are to see that they understand how to carry it out.—*United Service Gazette.*

A NAVAL BASE FOR THE PACIFIC.—It will be within the recollection of our readers that at the time we strongly deprecated the action of the Admiralty in relinquishing Esquimalt as a naval base, on purely economical grounds, and predicted that the time was not very far off when they would be compelled to reoccupy the place, at even a still greater expense than what they had saved in evacuating it. Not long since we returned to the subject, and reiterated our belief that the Admiralty would ultimately be forced to retrace their steps in this respect. We have not had long to wait for justification of the views we expressed on the subject, for it seems from the report now in circulation that the Admiralty have made up their minds, after much cogitation, to establish a Pacific and North American squadron, which, it is stated, will be composed of the present Fourth Cruiser Squadron and six cruisers of the *County* class, the scheme to take effect from May next. It must be said for the Admiralty that they foresaw a contingency of this nature arising, for when the naval yards at Esquimalt and Halifax were handed over to the charge of the Canadian government, it was subject to the condition "that they shall be available for the repair of His Majesty's ships, so far as their facilities admit, and that the Admiralty shall be free to resume possession at any time when naval in-

terests require it." That was but a short time ago, comparatively speaking, but events have moved so rapidly lately in the North American Continent that "naval interests" now apparently demand that Esquimalt should become the base for the Pacific and North American Squadron which is about to be formed.—*United Service Gazette.*

THE WORLD'S MERCHANT NAVIES.—In tonnage the merchant navies of the world are:

Great Britain	11,167,332
British Colonies	1,624,049
Total British	12,791,381
Germany	2,515,815
Japan	1,394,745
Norway	1,392,593
France	1,214,505
Russia	1,083,000
United States (ocean)	939,846
Italy	922,182
Sweden	744,307
Spain	722,517
Denmark	517,201
Holland	462,465
Total world merchant navy ton...	24,700,557

These figures show that more than half the world's merchant navy tonnage is British, while the American share is not 4 per cent of the total. Compared with that deficiency, coupled with our enormous foreign commerce, the wildest "ship subsidies" yet proposed are but as a "drop in the bucket" of our commerce and our national prestige, warrant and need.—WALTER J. BALLARD in the *Nautical Gazette.*

According to the *Portsmouth Times*, a further reorganization of the destroyer flotillas is now ordered. The Eastern Flotilla of 16 vessels is to be composed entirely of the *River* type of vessels, and all the 30-knot destroyers will be removed and reduced to nucleus crews. Two of the *River* type and six 30-knot vessels are to be permanently stationed at Portland with nucleus crews, ready at a few hours' notice to take the place of any destroyers of the permanent flotillas which may be temporarily incapacitated. The changes are to be completed by January 30. The *River* type boats, although having a speed of only 25½ knots, are much more strongly built than the 30-knot vessels, and the better suited for the hard work incidental to North Sea maneuvers. As a matter of fact, they can maintain their speed much more satisfactorily than the 30-knot boats, very few of which can keep up with them when hard pressed.—*United Service Gazette.*

An official return published last week shows that out of a total of 218,827 seamen (not including Lascars) available for British ships in April last year, 168,866 were Britons, 42,039 were foreigners, and 7922 were Colonials. About 200 were born at sea, or had no birthplace stated. Though from 1896 to 1901 the decrease of British seamen was 4597, in the next five years there was an increase of 7665. While, says the *Daily Mail*, there is no immediate prospect of a better supply of British sailors, owing to a decrease in numbers of younger men, there is a greater number of apprentices, who supply the officer class. The percentage of foreigners in the home trade fell from 6.8 in 1901 to 5.9 in 1906. Swedes and Germans are the most numerous.—*United Service Gazette.*

IMPORTANT WARSHIPS LAUNCHED BY THE SEVEN GREAT NAVAL POWERS DURING 1907.

Nationality.	Name.	Displacement.	H.P.	Speed.	Boilers.	Armament.	Class.
British	Bellerophon	18,600	23,000 (T)	20.75	Babcock	10 12-in.	Battleship
	Téméraire				Yarrow	10 12-in.	"
	Superb				Babcock	10 12-in.	"
	Inflexible	17,250	41,000 (T)	25	Yarrow	8 12-in.	Armored cruiser
	Invincible				Yarrow	8 12-in.	" "
	Indomitable				Babcock	8 12-in.	" "
	Defence	14,600	27,000 (R)	23	Yarrow	4 9.2-in. 10 7.5-in.	" "
French	Vérité	14,900	18,000 (R)	18	Belleville	4 12-in. 10 7.6-in.	Battleship
	E. Quinet	14,000	37,000 (R)	23	Guyot	14 7.6-in.	Armored cruiser
	W. Rousseau	14,000	37,000 (R)	23	Niclausse	14 7.6-in.	" "
German	Dresden	3,740	13,700 (T)	28.5	Thornycroft	10 4-in.	
	Ers. Pfeil	3,740	13,700 (R)	23.5	"	10 4-in.	3d class cruiser
	Stettin	3,450	13,200 (T)	24	"	10 4-in.	
Japanese	Aki	19,780	27,000 (T)	21.5	Miyabara	4 12-in. 12 10-in.	Battleship
	Kurama	14,620	25,000	21.5	"	4 12-in. 8 8-in.	Armored cruiser
	Ibuki	14,620	25,000 (T)	22.5	"	4 12-in. 8 8-in.	" "
	Tone	4,100	15,000 (R)	23	"	2 6-in. 10 4.7-in.	3d class cruiser
	Yodo	1,230	— (R)	12	"	2 4.7-in.	Scout
	Mogami	1,329	8,000 (T)	33	"	2 4.7-in.	"
Italian	Roma	12,625	20,000 (R)	22	Babcock	2 12-in. 12 8-in.	Battleship
	S. Giorgio	9,830	20,000 (R)	22.5	Bleychenden	4 10-in. 8 8-in.	Armored cruiser
	S. Marco	9,830	20,000 (T)	23.5	Babcock	4 10-in. 8 8-in.	" "
	Pisa	9,830	20,000 (R)	22.5	Belleville	4 10-in. 8 8-in.	" "
Russian	Imp. Paul	17,400	17,600 (R)	18	"	4 12-in. 12 8-in.	Battleship
	Bayan	7,887	16,500 (R)	21	"	2 8-in. 8 6-in.	Armored cruiser
U.S.A	Salem	3,750	16,000 (T)	24	Express	2 5-in.	Scouts
	Chester	3,750	16,000 (T)	24	"		
	Birmingham	3,750	16,000 (R)	24	Niclausse		

Note.—In the H.P. column (T) = Turbine, (R) = Reciprocating engines.

Note.—In the H.P. column (T) = Turbine, (R) = Reciprocating engines.

IMPORTANT WARSHIPS LAID DOWN BY THE SEVEN GREAT NAVAL POWERS IN 1907.

Nationality.	Name.	Displacement.	H.P.	Speed.	Boilers.	Armament.	Class.
British	Témémaire	18,600	23,000 (T)	20.75	Yarrow	10 12-in.	Battleship
	Superb	18,600	23,000 (T)	20.75	Babcock	10 12-in.	"
	Boadicea	3,300	18,000 (T)	25	—	3 4-in.	Scout
	St. Vincent	19,250	—	—	—	10 12-in.	Battleship
French	Diderot	18,400	22,500 (T)	19.25	Niclausse	4 12-in. 12 9.4-in.	Battleship
	Condorcet	18,400	22,500 (T)	19.25	"	4 12-in. 12 9.4-in.	"
	Verginaud	18,400	22,500 (T)	19.25	Belleville	4 12-in. 12 9.4-in.	"
	Voltaire	18,400	22,500 (T)	19.25	"	4 12-in. 12 9.4-in.	"
German	E. Bayern	19,000	— (R)	19	Thornycroft	12 12-in. or 16 11-in.	"
	E. Baden	19,000	— (T)	19.75	"		"
	E. Würtemberg	19,000	— (T)	19.75	"		"
	"F"	—	44,000 (T)	24.5	"	12 11-in.	Armored cruiser
	E. Greif	3,740	13,700 (T)	24.5	"	10 4-in.	Cruiser, 3d class
	E. Jagd	3,700	13,700 (T)	24.5	"	10 4-in.	" "
Italian	Amalfi	9,830	20,000 (R)	22.5	Belleville	4 10-in. 8 8-in.	Armored cruiser
	"No. 5"	9,830	20,000 (T)	23.5	"	4 10-in. 8 8-in.	" "
Japanese	Huki	20,700	20,000 (T)	20	Miyabara	12 12-in.	Battleship
	"X"	18,450	44,000 (T)	25	"	4 12-in. 8 10-in.	Armored cruiser
	Ibuki	14,200	25,000 (T)	22.5	"	4 12-in. 8 8-in.	" "
	"B"	4,100	15,000 (R)	23	"	2 6-in. 10 4.7-in.	Cruiser, 3d class
Russian (very doubtful)	—	? 4,500	?	? 24	?	?	? Armored cruiser
U.S.A	Delaware	22,075	— (T)	21	Babcock	10 12-in.	Battleship
	New York	22,075	— (T)	21	"	10 12-in.	"

Note.—In the H.P. column (T) = Turbine, (R) = Reciprocating engines.

In 1906 the ships laid down were as follows:

	Battle-ships.	Armored cruisers.	Small cruisers.
British	1	3	0
French	2	1	0
German	1	1	2
Italian	0	1	0
Japanese	1	0	1
Russian	0	1	0
U.S.A	2	0	0

—*Engineer.*

JAPANESE AND RUSSIAN SURGERY.—In his observations on the Russo-Japanese War, Major Charles Lynch, M. D., U. S. A., says:

"For the First Army complete statistics are available; this, it will be remembered, was always engaged in field and not in siege operations. Its percentage of rifle wounds is given as 84, shell 14, and bayonet 0.9. Differences in classification in different battles, etc., give rise to a very small error in calculating these percentages. In the Third Army, which up to the battle of Mukden was at Port Arthur, and so had only one field fight—that of Mukden—the rifle wounds were 59.44 per cent; cannon, 19.63; bayonet, 0.59; miscellaneous, 12.13; untraceable, 8.11. Full figures for the Second Army at the battle of Mukden are: Percentage of rifle wounds, 85.83; shell wounds, 13.73; bayonet wounds, 0.45. It is safe to conclude from these figures that, though the rifle has retained its pre-eminence as a wounding weapon in war, shell wounds have notably increased; in the field nearly all the wounds classified as shell wounds were caused by shrapnel. Some wild statements in reference to the frequency of bayonet wounds have been circulated; even so large a percentage as seven of all wounds has been ascribed to the bayonet. As a matter of fact, in the whole war not one per cent was due to this weapon. The large number of miscellaneous wounds in the Port Arthur army is notable. Some of these were caused by hand grenades, which were used largely there and to a considerable extent in the north in attacks on entrenched positions. All of these grenades were actually thrown by hand in the early part of the war, but later the Japanese made little mortars, some of them of wood, in which a small charge of powder gently lifted a can containing a high explosive, usually Shimose, from 200 to 400 yards, where a frightful explosion would occur.

"The First Army reports 32.03 per cent of severe wounds, 53.5 per cent of slight, 14.47 per cent very slight; the Third Army 26.76 per cent severe, 69.6 per cent slight, 3.54 per cent very slight. The Japanese classify as a severe wound one which so disables the recipient that he must be carried from the field; actually, some very severely wounded men staggered back to the dressing stations alone or with the assistance of less badly wounded companions. The figures in reference to the severity of wounds do not differ practically from the ones which are generally used to calculate the amount of transportation which will be necessary for wounded in battle.

"The total number of wounded in the First Army was 16,811, the number of killed, 4789; in the Second Army 10,070 were killed, 38,159 were wounded; and in the Third 19,363 were killed, 76,586 wounded; the proportion of killed to wounded was therefore higher than in any other recent wars. The location of wounds, based on 7489 non-selected cases in the Second Army, showed the following percentages: Head and neck, 16.08; trunk, 30.31; arms, 25.16; sexual organs, 0.20. The percentage of head wounds is rather higher than that usually found in field fights; this was to be expected, however, as the men were frequently entrenched, so that the head was much exposed relatively. Many cases of multiple wounds were seen.

"The percentage of wounded, according to branch of service with the Second Army, from May 4, and to include January 5, for the infantry, 36.27 per cent; engineers, 14.33 per cent; artillery, 8.44 per cent; cavalry, 6.22 per cent; sanitary company, 5.57 per cent; surgeons, etc., 4.66 per cent; train, 0.51 per cent. The percentage of wounded surgeons and sanitary company is lower in this table than it was for all armies in the whole war; reports from some armies show that their percentage of casualties was between that of the infantry and the artillery. A complete record of medical department casualties is found under medical *personnel*.

"Japan may be said to be yet in the pre-surgical stage of her development—that is to say, she has not reached a realization of the beneficent effects of good surgery, and in civil life surgery is a last resort, rather as it was with us in pre-antiseptic days. This has resulted in little specializa-

tion in surgery, and while many men may be found who have done good work in bacteriological pathology abroad, few surgeons with foreign instruction are met.

"Speaking generally, there is no doubt but that the Japanese surgeons were superior to the Russians, even with their deficiencies. What is needed in war is a high general average in surgical skill rather than a few specially skilled surgeons, as conditions are such that wounded must necessarily be treated at widely separated points; that fine surgeons would not find a good field for employment cannot be maintained, however. If the Russians had such surgeons they should certainly have been found in the great hospitals at Port Arthur and Mukden. As a matter of fact, they were not encountered in either place. Russian surgery, as exemplified by presumably as good men as they had at these two towns, was no better than that usually seen at the Japanese hospitals."—*Army and Navy Journal.*

THE SPEED OF TORPEDO-BOAT DESTROYERS.—The trials which have recently been carried out in the torpedo-boat destroyers of the *Tribal* class have been remarkable for the ease with which the contract speed has been obtained in spite of the limitations imposed. It will be remembered that a speed of 33 knots was to be maintained over a period of six hours, while the amount of fuel burnt per square foot of heating surface per hour was limited; the fuel was oil which these vessels are designed alone to carry. They were also required to have a radius of action of not less than 1500 nautical miles at 13 knots. That these requirements, which in some respects are conflicting, have been carried out, and the contract speed exceeded in all the boats of the class yet tried, is a vindication, if such were necessary, of the value of oil as fuel in vessels designed for purely military purposes.

The limitation of the amount of oil burnt per square foot of heating surface is no doubt wise in view of the danger of local overheating, which is always a possibility when such fuel is used. The usual allowance of heating surface per indicated horsepower in water-tube boilers of the Express type, when used in conjunction with reciprocating engines is 2⅛ square feet, which means that at full power the average evaporation over the whole of the heating surface is about 8 pounds per square foot. As the evaporation is very unequally divided among the tubes, those nearest the fire accounting for a much larger part of the steam generated than those more remote, an average of 8 pounds is probably quite high enough if the fire rows are not to be unduly stressed. When burning oil fuel there is a greater possible disparity between the work done by the fire rows and the remainder of the tubes, than in the case of a coal-fired boiler. The maximum temperature of the oil jets is attained in a zone of comparatively small area a foot or so from the burner nozzle and the boiler tubes in that vicinity effect a larger proportion of the evaporation than would be the case if the furnace temperature were more equally distributed. It may be assumed that the quantity of oil fixed as a maximum to be burnt per square foot of heating surface is the result of the Admiralty experiments on the evaporative results to be expected per pound of oil in boilers of this type, and the mean evaporation per square foot of heating surface which it has been found advisable not to exceed. Such a limitation necessitates ample heating surface in order to make sure of the power required for the contract speed; but, on the other hand, every square foot added means extra boiler weight and extra displacement, and some reduction in the radius of action. Fortunately, it appears that there was ample margin in this respect, though it seems from the speeds obtained—in one case 2.36 knots above the contract—that the designers have erred on the safe side as regards heating surface. These results, it may safely be assumed, are unattainable in similar vessels fired with coal, for, although the ill-fated destroyers *Viper* and *Cobra* reached equal speeds to those now realized in the *Tribal* class, they were not at their seagoing displacement,

and had no limitations as to the amount of fuel to be burned. We believe, moreover, we are right in saying that the *Viper*, in the course of her short career on service, never approached her measured mile performance. How much of the success is due to the turbines it is difficult to say. Possibly the equipment of such a vessel with reciprocating machinery of, say, 15,000 indicated horsepower on two, or even three, shafts would present insuperable difficulties within the limits of space and weight allowable, and taking also into consideration the straining actions due to the reciprocating forces on a comparatively light hull. Whether this mechanical problem is capable of solution or not, the superiority of oil fuel for the purpose of maintaining speed over a considerable period is abundantly demonstrated.

Two factors operate in the maintenance of speed when burning coal, the necessity of cleaning fires and the endurance of the stoker, neither of which has any significance when burning oil fuel. When burning coal at the rate of combustion required in these small tube boilers for full speed one or other of the furnace doors is practically always open for stoking, and the volume of cold air admitted must detract both from the efficiency of the boiler and its steam giving capacity. An indifferent stoker by keeping each furnace door open a few seconds more than necessary may, in the sum total of all the openings, make just the difference between a satisfactory and an unsuccessful trial. Oil burning still requires skill and intelligence on the part of the stoker, and perhaps of a higher order, but it does not entail that hard manual labor and constant supervision which makes a full-speed trial on a torpedo-boat destroyer burning coal more like a nightmare than an engineering performance. In one particular especially, the regulation of the boiler feed, the superiority of the oil-fired boiler is marked. Automatic feed regulators have not been a pronounced success in water-tube boilers of the small tube type, and it is always necessary to supplement the working of the apparatus by manipulation of the feed-check valve, the amount of hand regulation depending upon the character of the stoking and the consequent steadiness or otherwise of the rate of evaporation. With oil fuel, once the burners are set the feed pumps can be adjusted to the evaporation with a reasonable certainty that no manipulation of the feed valve will be required. In a word, stability of working conditions on which maintenance of full speed depends is easy of attainment with oil fuel, while it is comparatively difficult even with expert stoking when burning coal.

The speeds obtained in the *Tribal* class, though remarkable, do not appear from the particulars available to be due to any increase in the propulsive coefficient; they are simply the logical result of being able by means of oil-fired boilers and turbine engines to maintain a high power which otherwise would not be within reach. It is not intended to minimize the importance of the results; they are a fitting culmination—if that point has yet been reached—of the experiments which have been carried out by the Admiralty at Portsmouth and elsewhere, on the use of oil fuel in naval boilers; and the success is all the more gratifying when it is remembered that several other Admiralties, after a study of the subject, have practically given up the quest. But while it is permissible that we should shake hands with ourselves on the results, two considerations should moderate our enthusiasm. The first is that we are still dependent upon foreign countries for our supplies of oil fuel, and the other is that these turbine-engined boats are admittedly still a long way behind those with reciprocating engines in fuel economy at cruising speeds. The first-class torpedo-boats recently added to the navy list—formerly called "coastal destroyers"—are able at 13 knots to steam about 36 nautical miles per ton of fuel oil consumed. This is just about the same as the earlier 30-knot destroyers, with reciprocating engines, burning coal. The torpedo-boats are only about two-thirds the displacement of the destroyers, and it must be remembered that the former are using a fuel of 30 per cent greater calorific value than the latter. It is true that on account of the difference in length 13 knots

is a higher relative speed in the torpedo-boat than in the destroyer; but, making every allowance for this, there is obviously a very considerable margin in economy at this speed in favor of the reciprocating engine. The radius of action of the torpedo-boats referred to is only about 800 miles at 13 knots, that of the *Tribal* class of destroyers about 1500 miles, while the earlier 30-knot destroyers burning coal had a radius of action of nearly 3000 miles.

It is difficult to assign the relative importance of speed and radius of action. Speed is an offensive quality, but the necessity for its use may not arise till after many days steaming at ordinary speed, and radius of actions is therefore also an offensive quality. The two together are the modern equivalent of the weather gauge of Nelson's day, as the vessel having superiority in these respects can always choose to give or to decline battle. From the nature of our position it has always been necessary, and probably always will be necessary, for us to hold this advantage over our rivals. In "Before Port Arthur in a Destroyer," supposed to have been written by a Japanese naval officer in command of one of these vessels, there is much internal evidence of the value of radius of action. We read of the boats engaged in patrolling before Port Arthur coaling from a cruiser every 12 hours, and frequent mention of returning to a base to coal after only a few days at sea. In the battle of Tsushima the Japanese destroyers do not appear to have been in evidence till near the end, when they attacked the almost completely disabled Russian ships. Speed then was not of great importance, as the Russian ships could neither fight nor run away, but if the destroyers had been a day or two at sea they might not have had sufficient coal to deliver an attack at full speed had they desired to do so. Conditions such as these may operate in any conflict in which our destroyers may be engaged with the added disadvantage of increased distance from a base. Floating bases from which supplies of fuel may be obtained are, of course, a factor to be considered, but such vessels are necessarily slow in speed and require convoying, and they may under certain conditions hamper a fleet as much as help it. In the *Tribal* class, by sacrificing a knot in speed and putting the weight saved in machinery into fuel the radius of action would be increased by about 300 miles. As we are now possessed of destroyers which in the matter of speed are much in advance of anything possessed by any other naval power it is worth considering whether sufficient attention has not for the present been paid to this quality, and whether more attention should not now be paid to increasing the radius of action by increase of fuel supply and improvement of economy of the propelling apparatus at the cruising speed. —*Engineer.*

SHLICK'S GYROSCOPE FOR PREVENTING SHIPS FROM ROLLING AT SEA.—The trials of Doctor Schlick's gyroscope apparatus were made off the Tyne river during the week ended November 16, 1907, and were witnessed by the several railway and steamship companies interested in the cross-channel traffic. The following is an extract from an article descriptive of the working of the apparatus:

The apparatus consists of a heavy fly wheel rotating about an axis which is initially vertical and is carried by a frame which can oscillate about a horizontal axis lying transversely in the vessel, the oscillatory motion of the frame being checked by means of suitably adjusted brakes. The fly wheel is 1 meter (39.37 inches) in diameter, weighs 1106 pounds, and revolves 1600 times per minute. There is no electrical installation in the boat, and the fly wheel is driven by steam. The periphery is provided with rings of blades, the wheel being inclosed in a steam-tight iron casing and the whole worked as a turbine. The steam enters and leaves through the trunnions, exactly as in an oscillating engine, while the lower end of the spindle of the fly wheel is carried on ball bearings, and there is forced lubrication to both the upper and lower bearings. A regulator is fixed

automatically to cut off the steam at a certain number of revolutions. There are two brakes, controlled by hand wheels on deck; one a band brake, by which the gyroscope can be locked in any position, and the other a hydraulic brake. When the fly wheel is running at its working speed, if the casing is held firmly by the brake, so that it cannot swing, any rolling motion of the ship is not affected by the gyroscope. When the casing is allowed to swing, the motion being controlled by one of the brakes, the rolling is immediately checked, and, for all practical purposes, destroyed. Each tendency of the ship to roll is changed into a fore-and-aft oscillatory motion of the gyroscope accompanied by development of heat energy in the brakes.

There is no accumulation of roll, and the ship is to all intents and purposes a steady platform, having only a vertical or heaving motion. Generally speaking, if a rapidly rotating fly wheel is acted on by an external force which moves the wheel into another plane, the inertia of the wheel sets up a motion of the whole in a direction at right angles to the first external force. If this motion at right angles is allowed to take place, it sets up a force again at right angles to itself and equal and opposite to the first external force. Thus, the first external force, due to the rolling of the ship, causes the gyroscope to swing in a fore-and-aft direction, and the swinging sets up a force equal and opposite to the rolling of the vessel. This last-mentioned force is changed into heat in the brakes and the ship is kept upright. If the apparatus were allowed to swing freely, the rolling of the ship would not be checked, but its period of rolling would be lengthened, and this alone would contribute to making the vessel more comfortable.

In a late trial, although only ordinary sea conditions were encountered, yet the extinctive effect of the gyroscope was conclusively demonstrated. Sea waves up to 6 feet high and 50 to 100 feet in length were met with. The length of the waves was too short to show the apparatus to the greatest advantage, but the maximum roll to each side amounted to about 14 degrees with the gyroscope out of action and the boat was kept steady with the gyroscope in action.—*Nautical Gazette.*

One of the most notable papers presented at the 15th annual meeting of the American Society of the Naval Architects and Marine Engineers, had reference to the much-debated question of the stream lines around ship's models. As the outcome of a series of experiments in the Washington Experimental basin, Naval Constructor D. W. Taylor has developed a theory which may have an important bearing upon the design of vessels constructed for high speeds. An examination of the data produced by him discloses at once a condition of affairs very different from what is often supposed to be the case. The general assumption has been that the water would part more or less horizontally forward, follow a diagonal amidships, and aft would flow up from below. The figures show, however, that the water forward does not flow away horizontally, but insists upon passing under the vessel, and by no means along a diagonal. This general phenomenon has been noted in every case. The waves on the surface apparently influence the stream lines to a remarkable depth. In a number of cases it is found, on following up the sections to the surface, that apparent eccentricities in the stream lines correspond to hollows in the wave profile. The general features of the stream line around these models have been confirmed by a number of experiments with other models, and are thought to indicate that the commonly accepted notion as to the flow of water around the fore body of a ship is erroneous. Indeed, upon reflection, says the author, it is difficult to see how it would be mechanically possible for the water to flow out horizontally from the fore body and up vertically around the after body. Were this the motion, how could water be got to down below to take the place of that which flows up around the after body? If, however, we consider that the water flows down forward,

passes under the ship and then comes up again, we have a motion which is evidently mechanically possible. It is remarked that these stream lines, experimentally determined around models, show, broadly speaking, a remarkably close agreement with theoretical stream lines past submerged solids.—*Page's Weekly.*

A MACHINE FOR CLEANING SHIPS' BOTTOMS.—Interesting particulars are given by the *Morning Post* of a new contrivance for keeping the underwater bodies of ships, especially ships of war, free from marine growth. In the new invention the old principle of a hogging brush has been taken as a basis to work upon, and the help of electricity has been called upon to adapt it to existing conditions. In former days officers used to extemporize hogging brushes out of gratings, and these brushes were hauled up and down under the ship's bottom, but with the increased size of ships, and the introduction of steel, to say nothing of the passing away of the gratings, this method became obsolete. Force enough could not be applied to it.

What the inventors have done is to construct a framework which holds the necessary brushes, to devise suitable means for hauling it up and down under the ship's bottom, and to employ electricity to make the brush stick tight, like a magnet, to the bottom of the ship. The framework is flexible, somewhat on the Venetian blind principle; the brushes can be removed and replaced in a few minutes, almost in a few seconds; the working of the hog under the ship's bottom depends almost entirely on the use of gear already found on board every man-of-war; and the employment of electricity makes it possible to regulate the strength of the scrub to suit particular conditions. The machine has already been tried with satisfacory results in the home fleet, and negotiations are in progress for further experiments with it in the seagoing ships of the Channel fleet.—*United Service Gazette.*

UNITED SERVICE INSTITUTION PRIZE ESSAY.—The council of the Royal United Service Institution has selected as the subject for the Naval Gold Medal Essay, 1908, "The Command of the Sea: What is it?" The Lords Commissioners of the Admiralty have given permission for officers to write on this subject.—*Army and Navy Gazette.*

AERONAUTICS IN 1908.

A FORECAST OF PROGRESS.

Probably in the whole history of aeronautics no year has been entered with such high hopes as 1908, for this year has begun with the certain knowledge that aerial navigation is no longer a fantastic dream. The experiments and trials which were carried on up to the very end of 1907 were not successful enough to be conclusive, and yet they gave sufficient encouragement to the pioneers to press on with redoubled vigor.

That aeroplanes and dirigible balloons should have been tested in such a month as December, 1907, is a clear indication of the indomitable pluck and determination of the aeronauts, for up to a short time ago it was generally believed that aerial navigation was a fair-weather pastime, only to be attempted in the summer-months. As it was, work went on all through 1907, though of course no actual flights were made in rough weather. The air was taken on every available opportunity during all the seasons, and in stormy weather the time was occupied in putting finishing touches to new models, or making experiments and improvements indoors.

It is with a genuine feeling of relief that we look back on the past year, for it seemed that the new science would take a heavy toll of human life as experimenters became more numerous and more daring. But wonderful to relate, not a single life has been lost in aeronautical work, as distinguished from mere traveling in drifting balloons. The dirigible balloons

and the aeroplanes have been the cause of many accidents, but not one life has been lost. There were, needless to say, several marvelous escapes; but when we bear in mind that in previous years, with far fewer aeronauts at work, several lives have been lost and few successful achievements accomplished, it would seem that mere luck has not been the main factor in keeping the death roll blank during 1907. Taking even the most optimistic view of 1908, it can hardly be hoped that such a record will be equaled, for we are now entering a very dangerous stage. The success of the leaders will tempt many unskilled imitators to rival them, and, just as in the early days of automobilism, many accidents will result through inexperienced men taking charge of machines which they are unfitted to handle.

Then again each little success will tempt expert aeronauts to try their luck further, and thus they will leave themselves open to one of the many unexpected occurrences which bring disaster in every branch of locomotion. Our knowledge is yet very far from complete as to the strength of the various apparatus, and the air as a medium is peculiarly treacherous, owing to its physical properties. But at least the nature of these risks is now more fully understood by experimenters, and the fundamental fact has been demonstrated that human flight is possible. The enthusiasm of aeronauts is sufficient to guarantee that the work will henceforth be pursued unremittingly, even though a succession of disasters should occur, and public confidence for the time be shaken.

In the present year most interest will attach to the aeroplane experiments, and 1908 may reveal many grand secrets to us, and stand forth as the year in which the aeroplane or the heavier-than-air machine became really practicable. The year 1907 ended in tantalizing fashion. It was hoped all through that the Wright brothers would make some public demonstration in Europe, whither they had gone with the ostensible object of selling their plans. But no such trials were made, and eventually many people expressed themselves as skeptical of the Americans' claims. But I have always strongly believed in their work, and I felt it was merely an error of policy on their part which prevented them last year from proving their position as leading exponents in the art of the aeroplane.

Since their last public trials much progress has been made by other experimenters, and for one thing better and lighter engines are now being employed than those with which the Wright brothers made their sensational flights in 1905. But I cannot agree with the critics who assert that the Wrights have now been outstripped in the race by other aeronauts, and I have reason to believe that in 1908 they will give proof to the world of the marvelous skill which years of practice and experiment have given them. There are many other American workers, too, who may any day surprise the world with an epoch-making discovery.

Of the European aeronauts, Henri Farman has been the most successful. His latest achievement was the winning (on the 13th ultimo) of the Deutsch-Archdeacon prize for flying over a kilometer circuit. He had twice achieved this result unofficially in 1907, and it was hoped that ere the year closed he would have succeeded in making the record before the judges who must be present on such an occasion. The winning of this prize will be but one step in his progress, and he is rapidly gaining that experience which may enable him ere the end of the year to set up many records. The engine has been his main trouble so far, for the usual type of gasoline motor seems to behave very erratically after working in the air for some time. Something is now understood of the peculiar conditions which obtain in aerial locomotion, and with more reliable motors many of the aeronaut's difficulties will disappear.

Of the other workers, such as Bleriot, Esnault-Pelterie, Ferber, Santos Dumont, Vuia, and Gastambide-Mengin, much may be expected, though so far they have not achieved the success of Farman. This, the French school, is exceedingly active, and from the many crude and hastily evolved ideas something really practicable may result, which will advance the

aeroplane considerably. In English less progress is being made, and most of the work is done with models. Roe is perhaps the most promising experimenter, but the military authorities are testing a large machine in the Highlands of Scotland, from which much is expected. Bearing in mind the fate of the British military airship last year, one should be reserved, however, in hoping that the military experimenters will achieve much in aeroplane work just yet.

Turning to the dirigible balloon section, we may expect to find dirigible balloons actually placed on military duty on both sides of the Franco-German frontier this year, and the fleet of vessels will thus add a new factor the military situation. Italy is also building a military balloon, and the ill-fated British dirigible is being patched up and modified, in the hope of being made the equal of the French and German vessels. The parsimony of the British Treasury, which has hitherto hampered military aeronautical work in England, may, however, be altered, and if so, the British authorities may be able to evolve a more successful vessel. America has some headway to make in this branch, but 1908 should see her very active. Indeed, I look to America for much of the development which will be made during the year.

Certain it is that the great powers will have to seriously provide for this new engine of war, and with inventors stimulated by international competition, very many improvements may be expected. At present the Patrie type of vessel is the more favored, but the Zeppelin rigid-envelope airship may eventually lead to important modifications, especially if speed and power against the wind are to be reckoned of primary importance.

On the other hand, artillerists are active in preparing for aerial warfare, and already Germany has designed a motor car carrying a new gun which can be tilted up to 70 degrees when being used against airships. The speed and ubiquity of such a car will render it imperative that airships have a high ascensive power so as to keep out of range, and in this respect the Patrie type of vessel is superior, bulk for bulk, to the Zeppelin.

The equipment of the vessels, the building of aerial harbors, the invention of aerial artillery, and the creation of various types of vessels, such as small ships for reconnoitering and dispatch carrying, larger vessels as destroyers of the smaller, and still larger types for raids and attacking purposes, will make much progress—on paper at least—during the year, and by the following year warfare may be well nigh revolutionized.

The year 1908 opens with the dirigible balloon holding long distance and speed records, and most in favor with the military experts, but ere the 12 months have closed, the aeroplane will probably have secured the high-speed record, and may have signally displayed its utility in many forms of military work. To the peace lover it may be rather regrettable that much of the recent progress in aeronautics has been prompted by the desire to obtain new and more terrible engines of war; but this is only a passing phase, and an unavoidable one, since almost every development in locomotion is quickly availed of by military scientists. Aerial warships will make warfare more terrible, and thus perhaps cause nations to ponder more ere they fly at each other's throats. But as for the other reasons why aeronautics should be pursued, no thought need be given here, for the fact remains that the work *will* be pushed on independent of the material advantages which are to be derived.—*Scientific American.*

BOOK NOTICES.

"Over Seas in Early Days" (1828-29). By Lieutenant John Farley, U. S. A. Edited by Joseph Pearson Farley, U. S. A. Published by the Franklin Hudson Publishing Company. Price, $1.00.

This is a book of letters which came by accident into the hands of an appreciative son. They take the reader in an interesting, intimate way through Europe, in days of eighty years ago. Lieutenant John Farley, an army officer on furlough, spent a year in France, Italy, and Switzerland, and wrote charming letters home of his impressions. These were not written for publication; but it is evident that Lieutenant Farley saw much and thought deeply, as he traveled. Six months of the year were spent in constant travel, and he was fortunate when he made eighty miles a day. In those times travelers traveled in carriages, and in Italy combined for protection against the attacks of banditti.

We are given descriptions of architecture, paintings, and sculpture, in Rome and Florence, which are very readable. Lieutenant Farley visited Lafayette at his home, and realistically pictured the famous old patriot in his later days.

These are the letters of a cultured man, written long ago, but still pleasant to read.

"The Japanese Nation in Evolution." By William Elliot Griffis. Twenty-two full page illustrations; 12 mo., cloth, $1.25 net; postage, 10c. Published by Thomas Y. Crowell & Co., New York.

We are well acquainted with a number of Dr. Griffis' works—he has published over twenty—and have accorded high place to his "The Mikado's Empire;" but we believe that for the breadth of thought and high scholarship, his latest, "The Japanese Nation in Evolution," will rank as his greatest work. All of Dr. Griffis' books are well written, but some seem to be simple in conception to the one now before us. This last one stamps him as a rare scholar, well worthy to rank with John Fiske.

Dr. Griffis spent a lifetime in Japan as missionary, teacher, and university professor. He has lived and worked and studied in all parts of the island empire, and the great result of this is this book rather than "The Mikado's Empire," admirable and valuable though the latter undoubtedly is.

Every page in the "Japanese Nation in Evolution" is marked by vast erudition, and many popular notions are dispelled. To begin with, Dr. Griffis makes it clear that Japan is not purely a Mongolian nation, and never should be classed as such. The claim is made that the Japanese are more Aryan in ancestry than Chinese.

The Ainus, in the north of Japan, were conquered in the prehistoric days, and much intermingling of the races followed. Dr. Griffis claims that the Ainus were of Aryan ancestry. They certainly were not Mongolian. The savage Ainus to-day in Yezo have light skins and Caucasian features. The claim is made that their speech is clearly Aryan. It is to be regretted that the author has not given us some examples of that. For instance, in all Aryan tongues, from the ancient Sanskrit to Greek and English, the words father and mother have suffered but little change. It would be interesting to see this test applied to the Ainu tongue. Again, in the folk lore of all Aryan nations certain myths, such as that of William Tell, and Jack and the Bean Stalk, were common. It would be interesting to investigate the Ainu folk lore. In the folk lore of Aryan peoples are many myths, somewhat disguised to suit particular needs, but never the less one and the same. These myths originally were the attempted explanations of a simple people to account for natural phenomena. In chapter III Dr. Griffis gives several of the ancient Japanese myths. In Aryan myths the hero is always the sun, however disguised as a manly youth, battling to shine through clouds, fog, rain, mist, and the night. There is always a sunset, where the hero is overcome. And then there is a glorious sunrise, when the hero, really the sun, is once more resplendently victorious over all of his enemies. In the book before us is recounted an ancient, prehistoric Japanese myth based upon sunset and sunrise; there are heroes and heroines, but indubitably the sun, moon, and stars are the real characters. The similarity of this old Japanese myth is startling in its resemblance to some of the best-known Aryan myths. We regret Dr. Griffis did not go further into this.

Dr. Griffis claims there is much Malay ancestry to the Japanese, and he makes this claim good in the best way possible. He does not bring up a lot of records to prove it, but bases his claim on present and past Japanese habits. For instance, tatooing, a Malay, never a Chinese custom, was early practiced among the Japanese. The Chinese branded, they never tatooed. The early Japanese were head hunters and sword worshippers, Malay, not Chinese traits. Again, Japanese houses are built on Malay design, not Chinese or Korean.

The Mongolian strain is there, and much of the Japanese language was borrowed from the Chinese. Yet the ancient Japanese words of the Yamato people are clearly semitic.

Dr. Griffis brings out many ideas that surprise our preconceived notions, for instance, to the Japanese the Mikado is an institution, rather than a personality. The present Mikado, Mutsuhito, is unknown by name to millions of his subjects. It is predicted that this Mikado will go down in history with the Czar Alexander and Abraham Lincoln. He abolished caste and broke the chains of what was worse than slavery.

The classes of Eta and Hi-nin were pariahs, having no rights of any description. They were killed with impunity by any one. These were slain with as little thought as if they were beasts. These were the descendants of criminals, traitors, assassins, and leather workers, and by Japanese law were considered non-human. Mutsuhito, in 1871, gave

912,000 of these outcasts civic rights, and to-day their sons take honors in every Japanese university, and take high rank in the industries and professions of Japan.

Dr. Griffis analyzes Japanese religious sentiment and government with keen knowledge. He lived and studied with these people when the dawn of their new history commenced, and knows his subject well. There are interesting chapters on Japanese history, past and present, well worthy of comment, which is beyond this short notice. This book must always stand as a valuable contribution to our knowledge of Japan.

E. L. BEACH,
Lieutenant-Commander U. S. N.

"Les Flottes de Combat en 1908." 7th edition. 793 pages and 386 diagrams of ships. Published by Berger-Levrault & Co., 5 Rue des Beaux-Arts, Paris, France. Price, 5 francs.

ANNUAL REPORT OF THE SECRETARY AND TREASURER OF THE U. S. NAVAL INSTITUTE.

To the Officers and Members of the Institute:

Gentlemen:—I have the honor to submit the following report for the year ending December 31, 1907.

Itemized Cash Account.

Receipts During the Year 1907.

Items.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Totals.
Dues	$1,737 25	$ 451 75	$ 180 55	$ 202 47	$2,572 02
Subscriptions	626 97	239 25	234 74	226 06	1,327 02
Sale of extra publications	2,022 84	3,587 69	3,576 42	7,134 13	16,321 08
Sale of Proceedings	85 27	30 70	23 27	35 72	174 96
Advertisements	532 10	235 00	303 50	146 25	1,216 85
Interest on investments	343 75	191 81	392 51	305 27	1,233 34
Postage	5 89	3 82	4 09	....	13 80
Expressage	1 22	1 52	2 01	3 46	8 21
Binding	22 78	19 90	1 50	....	44 18
Life fees	60 00	....	....	....	60 00
Rebate on insurance	19 98	....	....	53 47	73 45
Credit	52	1 11	1 32	16	3 11
Premium on money orders	13	03	02	....	18
Rebate on bonds	....	....	....	1 25	1 25
Bonds	....	....	....	2,073 75	2,073 75
Totals	$5,458 70	$4,762 58	$4,719 93	$10,181 99	$25,123 20

EXPENDITURES DURING THE YEAR 1907.

Items.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Totals.
Printing and binding Proceedings	$1,580 28	$1,661 23	$1,234 52	$1,681 55	$6,157 58
Printing and binding extra publications	....	1,372 25	1,355 27	2,697 22	5,424 74
Salaries	630 00	630 00	630 00	710 00	2,600 00
Paid contributors	223 00	463 99	354 66	894 00	1,935 65
Postage, drayage, expressage and telegrams	185 13	145 99	166 36	184 08	681 56
Stationery	26 11	55 36	15 78	77 07	174 32
Paid authors of books	10 00	870 00	100 00	1,316 70	2,266 70
Purchase of books mainly for sale	123 15	152 08	139 20	103 58	518 01
Prize Essay award	216 25	10 00	....	....	226 25
Honorable Mention awards	180 00	....	....	....	180 00
Advertising agents commission	160 00	....	13 75	....	173 75
Transferred to Reserve Fund	....	60 00	....	....	60 00
Advertising	....	15 00	26 50	....	41 50
Insurance	....	....	13 00	80 00	93 00
Purchase of bonds	....	....	....	2,075 00	2,075 00
Rapid addressing machine	....	....	....	191 00	191 00
Miscellaneous	20 30	19 29	1 86	32 83	74 28
Totals	$3,354 22	$5,455 19	$4,050 90	$10,043 03	$22,903 34

SUMMARY.

Balance unexpended January 1, 1907	$26,189.84
Total receipts for the year 1907	25,123.20
Total available for the year 1907	$51,313.04
Expenditures for the year 1907	22,903.34
Balance unexpended January 1, 1908	$28,409.70
Bills receivable for back dues	1,169.20
" " " binding	13.00
" " " subscriptions	153.50
" " " extra publications	1,536.25
" " " Proceedings	.93
" " " advertisements	628.50
Value of back numbers of the Proceedings	350.00
" " Institute property (furniture)	300.00
" " extra publications	4,230.24
	$36,791.32
Liabilities	726.98
Total assets	$36,064.34

RESERVE FUND.

Baltimore & Ohio and Northern Pacific bonds	$4,683.14

The balance, $28,409.70, unexpended January 1, 1908, is distributed as follows:

Deposited in Seamen's Bank for Savings	$3,000.00
" with R. I. Hospital Trust Co.	2,500.28
" " Society for Savings, Hartford, Conn.	2,487.10
Southern Railway bonds	2,266.25
Washington R. R. and Electric Co.'s bonds	1,715.00
Northern Pacific and Great Northern bonds	5,027.50
Potomac Electrical Power Co.'s bonds	2,115.00
Northern Pacific bonds	6,581.20
Baltimore & Ohio R. R. bonds	529.36
Farmers' National Bank	1,577.79
Checks in safe, Naval Institute office	575.64
Money orders in safe, Naval Institute Office	1.30
Cash in safe, Naval Institute office	33.28
	$28,409.70

Respectfully,
PHILIP R. ALGER, *Professor U. S. Navy,*
Secretary and Treasurer.

The books of the Institute have been examined from February 9, 1907, to January 17, 1908, and found to be correct, and the balance sheet verified.

Auditing Committee:

W. H. G. BULLARD, Lieut.-Commander U. S. Navy.
E. L. BEACH, Lieut.-Commander, U. S. Navy.
H. J. ZIEGEMEIER, Lieut.-Commander, U. S. Navy.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. F. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CUILIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins,

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U.S.N

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U.S.N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U.S.N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U.S.N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U.S.N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U.S.N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U.S.N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U.S.N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U.S.N.

1896.

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U.S.N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U.S.N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U.S.N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U.S.N.

1897.

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U.S.N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U.S.N.I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898.

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U.S.N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U.S.N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U.S.N.

1900.

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U.S.N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U.S.N.

1901.

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U.S.N.

1903.

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U.S.N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U.S.N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U.S.N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U.S.N.

1904.

The Fleet and its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL, AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905.

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906.

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907.

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908.

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-fourth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fee to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly, and may be obtained by non-members upon application to the Secretary and Treasurer at Annapolis, Md. Inventors of articles connected with the naval profession will be afforded an opportunity of exhibiting and explaining their inventions. A description of such inventions as may be deemed by the Board of Control of use to the service will be published in the Proceedings.

Single copies of the Proceedings, $1.00. Back numbers and complete sets can be obtained by applying to the Secretary and Treasurer, Annapolis, Md.

Annual subscriptions for non-members, $3.50. Annual dues for members and associate members, $3.00. Life members fee, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1909.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1909. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention, may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

PHILIP R. ALGER,
Professor, U. S. N., Secretary and Treasurer.